ONE DOLLAR PER COPY

the OIL AND GAS JOURNAL

MAY 25, 1959

EDITORIAL • 79
EXPLORATION • 261
STATISTICS • 296

International Petroleum Exposition

Report on the Oil Show

p. 81

CRUDE AND PRODUCTS PIPELINE REPORT

p. 119

PAST · · · PRESENT and FUTURE

It's still a tradition at Halliburton to carry on the sage advice of our founder: "Don't ever stop trying to make things or do things better."

Every employee of this company believes in this principle. The benefits are increasingly evident by the mute testimony of the many successful wells cemented in the free world.

To maintain this leadership, we re-dedicate the future to "making things and doing things ever better"... to serve the petroleum industry in a future that promises big rewards to those who accept the challenge.

HALLIBURTON OIL WELL CEMENTING COMPANY
DUNCAN, OKLAHOMA

"Continue To Look To Halliburton — for Leadership"

the OIL AND GAS JOURNAL Newsletter

Tulsa, Okla.
May 25, 1959

The Oil Show revealed this about your tools:

They can do more work. But they're more complicated and more expensive.

A quick run-down on equipment trends for:

...Production. Accent is on reducing lifting and producing costs. Seen were a new wire-line multiple completion tool, several new pump designs, and a water-flood package (p. 90).

...Drilling. Competition is keen between electrical and mechanical drives for the rig and between gas-turbine or piston engines as prime movers. Over-all trend is for lighter, more portable, more flexible drives. One fact stands out: Nothing is in sight to surpass rotary drilling (p. 86).

...Pipelining. Bigger equipment came to the show emphasizing the trend to big-inch lines. Also seen were automation applications, automatic pipe welding, and new competition from plastic and aluminum in the pipe field (p. 94).

...Refining. From the smaller hardware on display, big trend toward automation was apparent (p. 98).

Several big sales of equipment were announced at the show, which set records in displays and attendance (p. 81).

Growth of the industry outside the U. S. also was apparent in number of foreign manufacturers displaying equipment and record number of foreign visitors to the show (p. 84).

▼ ▼ ▼

Foes of depletion allowance have passed up a chance to cut the allowance. It probably means any showdown on the tax matter will be postponed until next session (Details, p. 104).

New approach to severance taxes has been dreamed up by California lawmakers.

One legislator is pushing a measure to base the tax on market value of crude at the refinery and on natural gas as it enters local distribution stations.

Result would be taxes on foreign crude imports and out-

The Oil and Gas Journal is published weekly with an additional issue in January by The Petroleum Publishing Co., 211 S. Cheyenne, Tulsa 3, Okla. Second-Class postage paid at Tulsa, Okla. Copyright 1959 by The Petroleum Publishing Co. United States and foreign rates to the petroleum industry, 1 year $5, 2 years $8, 3 years $10.

of-state natural-gas receipts. Bill would cost oil companies in California an extra $24.4 million annually.

▼ ▼ ▼

Reports from Alaska say the important 1 Antonio Zappa wildcat on Iniskin Peninsula has penetrated 690 ft. of oil-bearing and 190 ft. of gas-bearing formation.

Drillers have set casing at 6,075 ft. and are drilling ahead.

The Halbouty-King wildcat on Alaska's Kenai has been abandoned at 12,037 ft. and the hole plugged.

Company spokesmen reported drillers found nothing to warrant completion attempt.

Coastal Drilling's rig, meanwhile, has moved to another job on the Union-Ohio lease 8 miles south of town of Kenai.

Offshore Lake Erie drilling continues at a fast pace on the Canadian side. American states are still dragging their feet which slows down activity on U. S. side.

Activity on Canadian side should be good for at least 2 years. All areas of lake show good promise for successful gas development.

Prospects of another East Texas strike have faded.

Reports of success at Grand Saline salt dome in Van Zandt County came a cropper when Shell's tests recovered only 3 gal. of heavy black tar (Details in exploration section, p. 261).

Bids for an offshore platform in California have been asked by Texaco.

Winner will design, fabricate, and install the platform in 84 ft. of water on the 3,840-acre offshore Parcel D off Santa Barbara County.

The parcel was taken by Texaco, Monterey, and Newmont last summer on a $23.7 million bid.

▼ ▼ ▼

Texas producers will be on a 10-day rate in June.

Railroad Commission slashed daily allowable by 282,738 bbl. setting permissive production at 2,904,414 bbl. daily.

Most majors requested the 10-day schedule. Independents feared any higher production would result in pipeline proration.

Behind the move are heavy products stocks which threaten the price structure of both products and crude.

▼ ▼ ▼

Trans Canada wants to step up its gas exports.

Company has applied to Alberta Oil and Gas Conservation

Board for permit to export 420 billion cubic feet more of gas. Delivery would be over a 22-year period and would boost the company's export request to 1.32 trillion cubic feet.

Trans Canada has signed contracts with five major producers in South Westrose field, 130 miles north of Calgary, to supply the gas.

Next move: A Trans Canada request to export Alberta gas to the U. S. at Emerson, Man., where it will be delivered to Midwestern Gas Transmission.

Heard at Pittsburgh API pipelining gatherings:

...Reports on new turbine meters are good.

...Interface detection still being developed.

...Gas-turbine experience on oil lines is promising, and this driver may go into some future projects.

...High-strength, thin-wall pipe is very attractive.

...Contracting of maintenance has proved itself.

(The complete details on p. 106-107).

Other pipeline news: Canada's National Energy Board, soon to be named, will not have as broad powers as envisioned by the Borden Commission (p. 110)...Transwestern now shows that FPC staff earlier conceded gas reserves would support California to Texas pipeline (p. 104).

Conversion of coal mine into storage vault for natural gas is being undertaken by Public Service Co. of Colorado.

Tests are being made now to determine if Leyden lignite mine near Arvada is gas tight. Plans call for cavern to be developed into permanent storage for three billion cubic feet of natural gas. It would relieve Denver area's gas problem.

▼ ▼ ▼

Hess is already expanding its new 45,000-bbl. refinery.

Contract has been let to Lummus to expand the Seawaren refinery to 75,000 bbl. daily. Hess also is planning to add a fluid catalytic cracking unit and a Udex unit.

Moving liquefied natural gas by tanker has attracted attention of more than a dozen companies.

All are keeping close check on success of Constock's shipment of methane from U. S. Gulf Coast to England.

Several companies have drawn up plans for converting a ship to methane service. Some plan to convert T-2 tankers.

Look for some of the big integrated companies to be ready to jump quickly into the methane-shipment picture if Constock's program proves highly successful.

Petrochemicals are still growing at an outstanding rate.

Ammonia is the only product suffering from over capacity. Rest of the industry facs a bright future with polypropylene

rated as one of the real hot comers for the future.

This outlook was given Kansas City session of American Institute of Chemical Engineers (Details, p. 112).

▼ ▼ ▼

Auto summer vacation travel probably will hit an all-time record high this year.

That's the bet being made by Indiana Standard's marketing people. Many new national parks and private recreation areas have opened up, they point out. So company is expanding its travel services.

Pre-travel information including maps, routings, and other data is being expanded now to include a local travel information center at each Standard station.

British Petroleum is using custom blending as weapon to grab big share of German retail gasoline market.

Blending pumps will be installed at 3,000 BP service outlets in Germany. They will furnish regular-grade gasoline and 25%, 50%, 75% and all premium grade.

Humble confirms it will enter the Arizona retail market in early July with purchase of Sahuaro Petroleum Products Co., Phoenix. That will give Humble 85 stations in the Phoenix and Maricopa County area.

Second deal also is in the making. Doyl Willis, owner of Sahuaro, also owns Five Star Oil Co., which operates some 40 independent stations. These also may go to Humble.

New airport servicing at Dallas' Love Field may set a pattern for refiners and marketers.

Airliners began refueling there last week with probably the cleanest product ever made available at an airport.

Reason: Avgas and jet fuel are channeled to the field directly from Humble's big Baytown refinery. By eliminating multihandling and an elaborate system of filtering and metering contamination is cut to the bone.

Fuel contamination—by moisture or other impurities—has caused freezeup of jet engines at high altitudes.

▼ ▼ ▼

Reason behind Sinclair's Chicago stockholder meeting: Nearly 10,000 people in Chicago area hold million shares of Sinclair stock.

The meeting, first Sinclair has ever held outside its state of incorporation, aimed to get company affairs closer to a large block of stockholders.

What they learned: Sinclair will spend $135 million this year, up $4 million, with $87 million going into exploration and production...and the Dinosaur will be revived as Sinclair marketing emblem.

Your KEY *to* Quick Service

on the

Best Supplies

OFFICES AND STORES

ILLINOIS—Carmi, Clay City, Mt. Vernon, Salem

KANSAS—Chase, Great Bend, Liberal, Pratt, Russell, Wichita

LOUISIANA—Shreveport

NEW MEXICO—Farmington, Lovington

OKLAHOMA—Duncan, Oklahoma City, Pauls Valley, Pawhuska, Sapulpa, Tulsa

TEXAS—Abilene, Amarillo, Borger, Dallas, Houston, Midland, Odessa, Pampa.

TO GET WHAT YOU WANT
WHERE YOU WANT IT
WHEN YOU NEED IT...
AT REASONABLE
COMPETITIVE PRICES

"Buy From Bovaird"

THE Bovaird SUPPLY COMPANY

GENERAL OFFICES
TULSA, OKLAHOMA

88 YEARS OF PROGRESS WITH THE OIL INDUSTRY

the OIL AND GAS JOURNAL

MAY 25, 1959 • VOLUME 57 • NUMBER 22

TULSA OFFICE
211 South Cheyenne Ave.
Phone LUther 4-4411

THE STAFF

George H. Weber ..... Editor
Henry D. Ralph ..... Chief Editorial Writer
Ted A. Armstrong ..... News Editor
Gerald L. Ferrar ..... Engineering Editor
Dr. Frank J. Gardner ..... Exploration Editor
Paul Reed ..... Pipeline Editor
John C. Reidel ..... Petrochemical Editor
W. L. Nelson ..... Technical Editor
Lynn M. Nichols ..... Presentation Editor
John C. Casper ..... Economics Editor
W. B. Bleakley ..... Production Editor
Neil Williams ..... Associate Editor
Peter B. Bike ..... Geophysical Editor
Carl J. Lawrence ..... Assistant News Editor
Gene T. Kinney ..... Assistant Pipeline Editor
R. B. Tuttle ..... Equipment Editor
C. Dudley Johnston ..... Art Director
Robert B. Bizal ..... Editorial Research
Carl Hoot ..... District Editor
John C. McCaslin ..... District Editor
W. A. Bachman ..... District Editor
Deacon New ..... District Editor
Merle F. Blakely ..... District Editor
Sara Bangert ..... District Editor
Max L. Batchelder ..... Asst. Pres. Editor
Helen Brown ..... Editorial Assistant
Alice Burt ..... Editorial Assistant
Aileen Cantrell ..... Editorial Assistant
Susan Boeckman ..... Editorial Assistant
Margaret Higgs ..... Editorial Assistant
Jo Jeanne Speaker ..... Staff Artist
E. P. Stadler ..... Staff Artist

NEW YORK OFFICE
500 Fifth Avenue
Phone LOngacre 4-1910

Paul Swain ..... International Editor
Larry Resen ..... Refining Editor
Ray G. Gibson ..... District Editor
John P. O'Donnell ..... District Editor

HOUSTON OFFICE
802 American Investors Building
Phone CApitol 4-7726

Ed McGhee ..... Drilling Editor
Howard M. Wilson ..... District Editor

DALLAS OFFICE
1238 Mercantile Building
Phone Riverside 8-3074

Robert J. Enright ..... District Editor

LOS ANGELES OFFICE
650 South Grand Avenue
Phone MAdison 2-0722

D. H. Stormont ..... West Coast Editor
William T. Smith ..... District Editor

WASHINGTON OFFICE
621 Albee Building
Phone District 7-1710

Joe Reilly ..... Washington Editor

Correspondents at Denver, Pittsburgh, Calgary, Columbus, Ashland, Ky., Oil City, Pa., Mount Pleasant, Mich., Melbourne, Australia; Regina, Sask.; Chatham, Ont.; Casper, Wyo., and Anchorage, Alaska.

POSTMASTER: Send notification (Form 3579) regarding undeliverable magazines to The Oil and Gas Journal, 211 S. Cheyenne, Tulsa 3, Okla.

SUBSCRIBERS: Send subscription correspondence and change of address to The Oil and Gas Journal, 211 S. Cheyenne, Tulsa 3, Okla. Subscribers should notify publisher promptly of any change of address, giving old as well as new address, and including city postal delivery zone, if any. If possible, enclose an address label from a recent issue of the magazine. Allow one month to six weeks for change to become effective.

IN THE NEWS

IPE News

Record IPE Crowd Finds Better, Costlier Oil Tools 81
Delegates From Abroad Come in Record Numbers 84
Manufacturing Competition Will Pay Off for Driller 86
Gardner-Denver Enters Drilling Rig Field 88
Mud Pumps Are Lighter, Thanks to Better Metals, Design 89
New Device Gives Constant Bottom-Hole Pressure Check 90
Atom Smasher Harnessed for Use in Logging Tool 91
Automatic Oil Field Has Arrived 91
Parkersburg Unveils New, Unconventional Pumping Unit 92
First Wire-Line Multiple Completion Tool Exhibited 93
Giant Pumping Unit Will Specialize in Water Floods 93
Pipeline Equipment Is Ready for Bigger Jobs 94
Pipeline Valves Show Design Improvements 96
Exhibits Show Rise in Pipeline Automation 96
Pipeline Meters Grow Giant-Sized to Meet Demand 97
Practice Panel Helps Train Refiners 98
New Continuous End-Point Analyzer Shown 99
Simple, Low-Cost Reflux-Flow Controller Developed 99
Grand Old Men Honored in Impressive Ceremonies 100

Domestic News

General Interest:

Depletion Foes Pass Up Chance for Showdown 104
Canadian Oil Man Urges Unrestricted U. S.-Canadian Oil Flow 105
New Mexico Adopts Simplified, Uniform Tax System 109
Less Power Eyed for Canada's National Energy Board 110

Exploration:

East Texas "Sure Thing" Fizzles 261
Neglected Southern Utah May Deserve Better Treatment 262
West Virginia Drilling Play Speeds Up 264
Small-Field Profits Are a Big Company Problem 275
April Well Completions 284

Processing:

Annual Gasoline Sales Hit 59 Billion Gallons 108
OCAW and ICWA Drop Merger Talks 111
Petrochemicals Expected to Continue Fast Growth 112

Pipelining:

Transwestern Shows FPC Staff Did About-Face on Reserves 104
Panel of Experts Outlines Trends in Pipelining 106
Supreme Court Studying CATC Gas-Sales Case 110
Computers Are Saving Pipelines Time and Money 113

Foreign:

Algeria's Hassi Messaoud Field Is Growing Daily 114
(Sixth in a series of special foreign reports)
27-Well Platform Being Towed to Gulf of Paria 116
Japanese to Spud Wildcat in Persian Gulf Next Week 117
New Bid for Sumatran Properties Made by Japanese 118

OIL AND GAS PIPELINES • REFINING • PETROCHEMICALS
EXPLORATION • DRILLING • PRODUCTION • FIELD PROCESSING

. . . an integrated magazine serving an integrated industry

API PIPELINE REPORT

Crude Line Handles Four Products . . . 119
By A. N. Horne

Conventional crude-oil pipelines can handle a wide variety of the direct and indirect products of oil and gas wells. The Texaco-Cities Service pipeline from South Oklahoma to the Chicago area handles natural-gas liquids, middle distillates, heavy ends, and crude oil in batches. Operation has been successful.

Continuous Pressure Traverse in Pipelines . . . 123
By Howard J. Endean, Robert M. Howard, and James E. Knizner

A study of Gulf Research & Development Co. has shown the feasibility of conducting internal surveys of pipelines. A variety of measuring procedures are readily adaptable for continuous recording while the instruments are pumped through a pipeline. Grade, curvature, roughness, pressure, temperature, leakage, and possibly potential can be recorded.

How Laurel Pipeline Moves 16 Grades of Products . . . 128
By James F. Stephenson and Marlan G. Jordan

The 16 grades of products are delivered from Philadelphia area refineries into 9 gasoline tanks and 8 distillate tanks. Products are sized into separate batches in accordance with the demand created by the 19 sales terminals on the way to Cleveland, and depending on activities of two other carriers in Pennsylvania, and one other carrier in Ohio.

A Survey of Pipeline Research and Development 131
By M. J. Dabney

The pipeline industry was well established by 1920 but in the years that followed very rapid changes took place. These were largely due to the results of research and development work. Of particular note is the work done in the hydraulics field. Equipment development has also played an important part.

Contamination Reduction Starts with Design 139
By William W. Holt, Jr.

Contamination is expensive to pipeline operation and any small reduction results in a direct saving. Design of pipelines for minimizing this loss is most worthwhile. This consideration is especially important in short lines involving a few stations.

TECHNOLOGY—OPERATION

Future Energy Consumption in the U. S. . . . 146
By Jack Melnick

This look at the growing need for energy assumes a minimum average increase in labor productivity of 2% a year and population growth of 1.93 million per year. On this basis 39.4% more petroleum should be consumed in 1965 than in 1958. Natural-gas consumption is due to increase 35.2% over the same period.

Revised Hydrogen-Limit Curves . . . 160

Here are new data on operating limits for equipment and alloy steels in contact with hydrogen at high temperatures and pressures. These data from an API Refining Subcommittee provide for useful extension of 1949 information.

Fracturing Pays Off in Eastern United States 162
By Wendell S. Moore

Fracturing of newly completed and old wells has become an integral part of the natural-gas and oil industry in the Appalachian area. Fracturing of water-injection and producing oil wells in secondary-recovery projects is now accepted completion procedure.

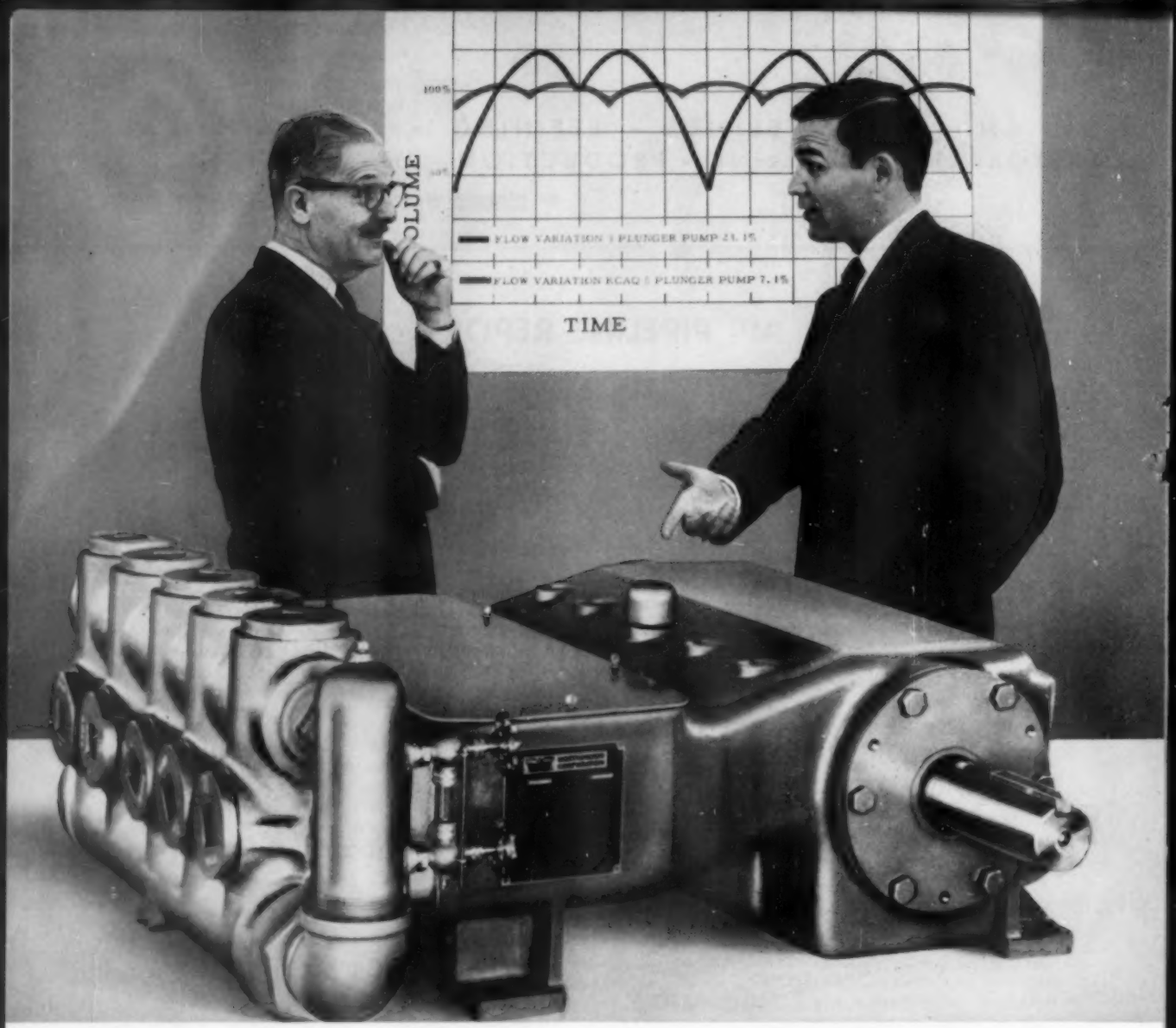
Deep-Well Cementing in Pecos County, Texas 170
By J. O. Woodson and C. L. Fulton

Testing of cement blends for the deep-well jobs led to these conclusions: (1) Cement blends should be tested before job is run at bottom-hole temperatures above 260° F.; (2) at high temperatures it becomes more difficult to retard the slurry as weight decreases; and (3) use of silica flour results in a superior cement blend for high-temperature squeeze.

Pipeline Construction Report . . . 190

DEPARTMENTS

Advertisers' Index	305	Editorial	79	Personals	291
Book Review	143	Equipment Men in the News	247	Pipeline Construction Report	190
Calendar of Events	70	Exploration Highlights	261	Refining Statistics	299
Classified Advertising	301	Foreign News	114	Statistical Summary	296
Deaths in the Industry	294	Journally Speaking	77	They Say	66
Drilling Contractors	259	Markets	300	Trade Literature	241
Drilling Statistics	297	New Equipment	228	Watching Washington	111



NOW! A 5 PLUNGER WATERFLOOD PUMP

for less than competitive 3 plunger models

You're looking at Worthington's new KCAQ Quintuplex waterflood pump.

This new 5 plunger 3 inch pump will deliver the horse power of competitive 3 plunger 4 inch pumps—yet sells for less money. And as the chart above shows, the KCAQ is a much smoother pump, delivering its volume with 70% less surge.

THE KCAQ HAS 6 OUTSTANDING FEATURES:

1. **Meets wide range of conditions.** Plunger diameters can be varied from 1¼ to 2½ inches.
2. **Fewer Spares to carry**—wearing parts interchangeable with 3 plunger KCA pump.
3. **Many "extras" included as standard** such as solid ceramic or Colmonoy plungers, suction air chamber to minimize noise and pulsation, plunger packing and stuffing box cover.
4. **Flooded suction adequate** because large pipe connections minimize friction. 4" suction, 3" discharge on either side.
5. **Less valve wear** resulting from guided, wing-type valves that are self-grinding. Liberally-sized suction and discharge valves both removable through single top covers.
6. **No shaft deflection problems.** Extra heavy crankshaft has 3 *roller* bearings.

Before you buy any waterflood pumps, investigate Worthington's new low cost KCAQ unit. Your nearby Worthington representative has complete information. Or write to Worthington Corporation, Section 32-5, Harrison, New Jersey. In Canada: Worthington (Canada) Ltd., Brantford, Ontario.

WORTHINGTON

US RUBBER PACKING

You may be. Consider this: How much does it cost you every time you shut down a production line to replace the packing in just one piece of hydraulic equipment? Now, multiply this by the amount of times this same equipment has had to be re-packed, say, in the past three years. And multiply this figure by the total amount of hydraulic equipment in your production system.

This downtime cost is enormous—just for packing. It's far higher than the cost of the packing itself ...and a lot more than the pennies saved by buying less expensive, inferior packing.

It's for this reason that packing like U.S. Matchless® is, by far, your most economical buy. It's made in a variety of styles, each for specific applications. Used and recommended by many of the leading original equipment manufacturers, Matchless is a packing you can trust to do the job longer, better... to turn downtime losses into uptime profits.

• • •

When you think of rubber, think of your "U. S." Distributor. He's your best on-the-spot source of technical aid, quick delivery and quality industrial rubber products.

US RUBBER

Mechanical Goods Division

United States Rubber

WORLD'S LARGEST MANUFACTURER OF INDUSTRIAL RUBBER PRODUCTS

Rockefeller Center, New York 20, N.Y. In Canada: Dominion Rubber Company, Ltd.

You save money when your "Oilwell" pumps are equipped with...

Pistons are the new "4-on-1" Wilson-Snyder design with the never-wear-out piston body which will take four different sizes of piston rubbers.

DI-HARD Liners have that exclusive armored lining of patented DI-HARD metal which gives greater service life, but for which you pay no premium.

Valves and Seats are designed with greater metal-to-metal contact than is provided in most other makes, yet have more fluid flow through the seat to improve pump efficiency.

Rod Packing is selected with full consideration for piston rod wear, to give maximum performance.

Liner Packing with Lantern Rings is properly designed and spaced to pack off the liners under all pressures.

Genuine "Oilwell" Parts

LONGER SERVICE results in fewer replacements when "Oilwell" expendable fluid end parts are used in your slush pumps. They are designed and engineered to exact specifications for "Oilwell" pumps ... then packaged in modern containers so that each part is factory perfect when it goes into your pump.

These GENUINE "Oilwell" parts, as well as a wide variety of other top-quality maintenance supplies, are available at your nearest "Oilwell" store. Use them always and get maximum performance from your slush pumps.

USS, "Oilwell," Wilson-Snyder, DI-HARD, HI-HARD *and* CHROMEX *are registered trademarks*

HI-HARD Piston Rods are surface-hardened with electronically controlled induction equipment, then ground and polished to produce the HI-HARD surface with high tensile core. Round root threads resist fatigue.

CHROMEX Piston Rods have an added coating of smooth, hard chrome for corrosive mud or severe service conditions.

Gaskets are made to rigid specifications and exact dimensions to provide dependable sealing.

Oil Well Supply Division of USS United States Steel

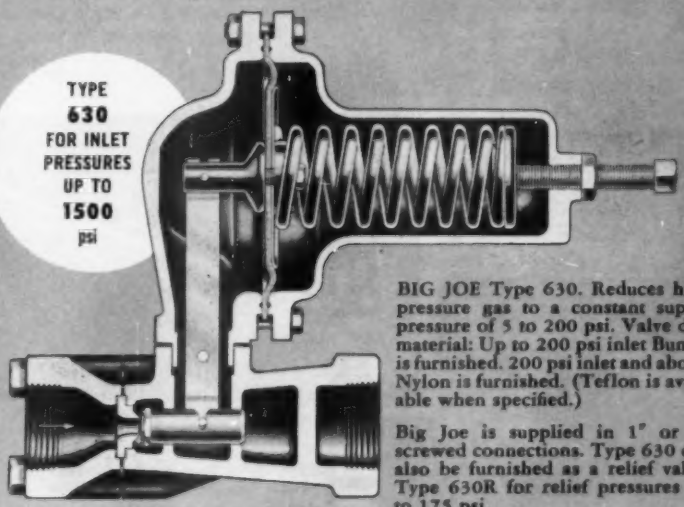
Branches Serving All Oil Fields Executive Offices—Dallas, Texas Export Office—30 Rockefeller Plaza, New York 20, N. Y.

Your *FISHER/MAN* Brings You

FISHER PRESSURE REGULATORS

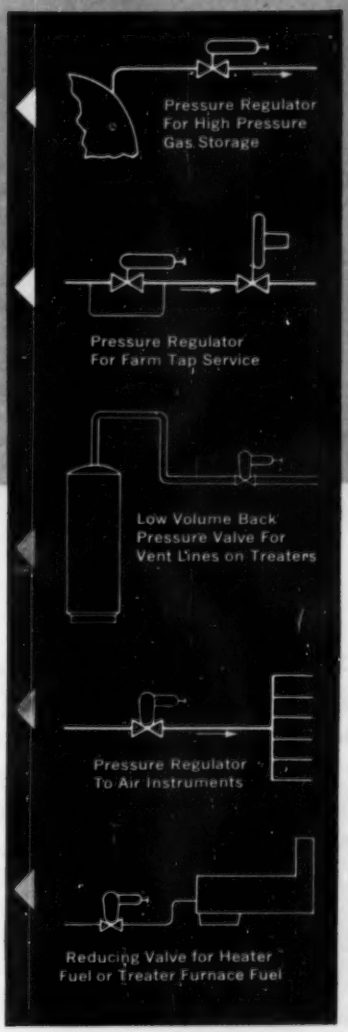
- Built for rugged, high pressure jobs
- Designed for dollar saving installations

TYPE 630 FOR INLET PRESSURES UP TO 1500 psi



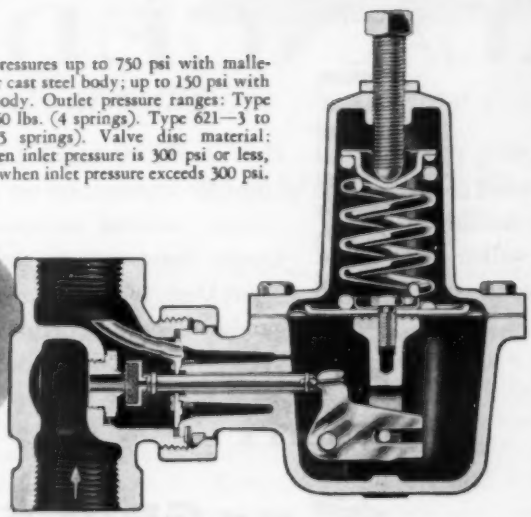
BIG JOE Type 630. Reduces high pressure gas to a constant supply pressure of 5 to 200 psi. Valve disc material: Up to 200 psi inlet BunaN is furnished. 200 psi inlet and above, Nylon is furnished. (Teflon is available when specified.)

Big Joe is supplied in 1" or 2" screwed connections. Type 630 can also be furnished as a relief valve, Type 630R for relief pressures up to 175 psi.


Pressure Regulator For High Pressure Gas Storage
Pressure Regulator For Farm Tap Service
Low Volume Back Pressure Valve For Vent Lines on Treaters
Pressure Regulator To Air Instruments
Reducing Valve for Heater Fuel or Treater Furnace Fuel

For inlet pressures up to 750 psi with malleable iron or cast steel body; up to 150 psi with cast iron body. Outlet pressure ranges: Type 620—3 to 60 lbs. (4 springs). Type 621—3 to 100 lbs. (3 springs). Valve disc material: BunaN when inlet pressure is 300 psi or less, and Nylon when inlet pressure exceeds 300 psi.

TYPE 620 FOR INLET PRESSURES UP TO 750 psi



IF IT FLOWS THROUGH PIPE ANYWHERE IN THE WORLD...CHANCES ARE IT'S CONTROLLED BY...

FISHER GOVERNOR COMPANY

Coraopolis, Pa. / Woodstock, Ontario / London, England

Main Office and Plant: MARSHALLTOWN, IOWA

FISHER®

SINCE 1880

BALANCED DENSITY

BALANCED DENSITY

BALANCED DENSITY

BALANCED DENSITY

Davison *balanced density catalysts* save you dollars. Davison balances density against particle size distribution and catalytic stability, with all the precision of a tightrope walker to give you maximum activity maintenance and regeneration efficiency.

Here is why. Controlled pore size results in lower air consumption per unit of coke burned —lower residual carbon—lower CO_2/CO— greater resistance to thermal deactivation. Write Dept. 4025 now for your copy of Davison Product Service Bulletin No. 59-104.

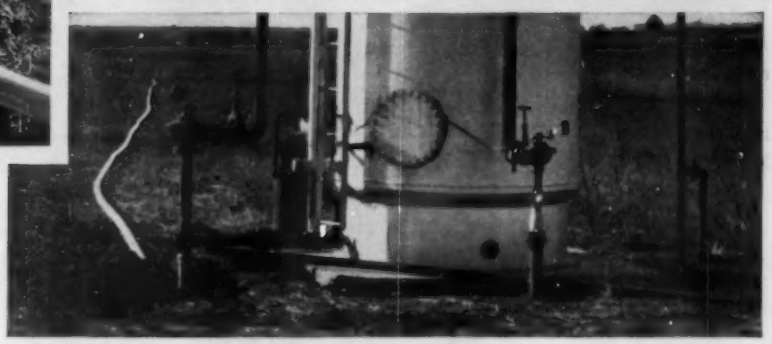
W.R. GRACE & CO.
DAVISON CHEMICAL DIVISION
BALTIMORE 3, MARYLAND

News about

B.F.Goodrich Chemical *raw materials*

Geon pipe running to tank battery and water separator in distance is concealed by freshly covered-over trench. Geon pipe is being used for oil and gas lead lines up to 250 psi working pressures.

Three-inch Geon pipe leads through fitting made of Geon into 4-inch salt water disposal pipe, also made of Geon.



Three-inch Geon pipe carries salt water from a crude oil de-watering tower to a disposal well 1000 feet away. It will be buried after a second line feeding into the disposal line is installed.

Hundreds of wells per year show how to . . .

save with pipe of Geon

Pipe made from Geon rigid vinyl saves time and work—it is so lightweight and easy to install. And maintenance costs are considerably lower.

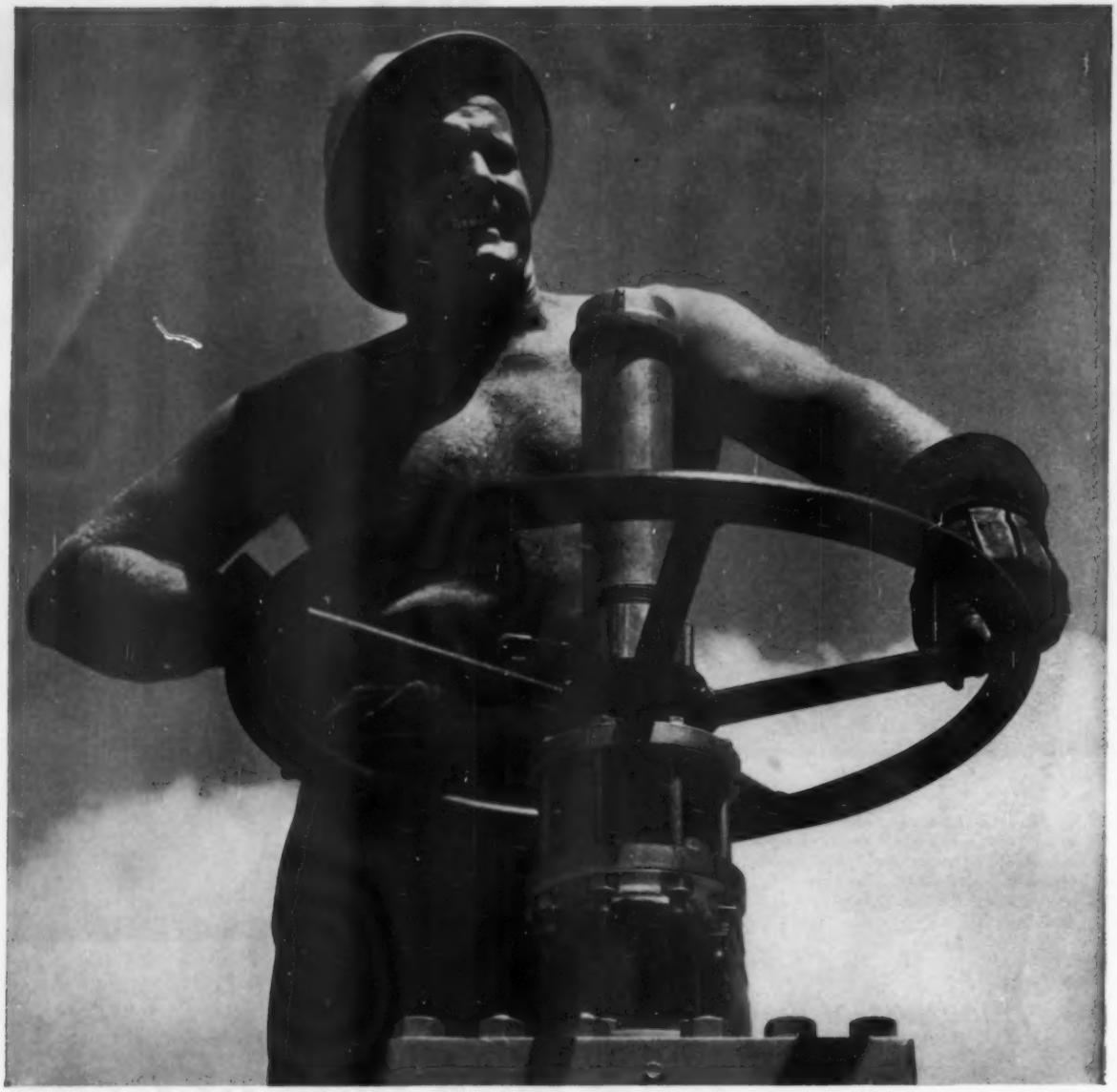
Pipe of Geon is immune to galvanic corrosion, is highly resistant both to salt water and sour crude oil. It stays smooth inside and out. And it provides high tensile or impact strength, standing up under pressure.

Engineers are taking advantage of the unique properties of Geon pipe for a wide variety of applications. For information on how you can cut costs by using pipe of Geon, write Dept. AN-2, B.F.Goodrich Chemical Company, 3135 Euclid Avenue, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

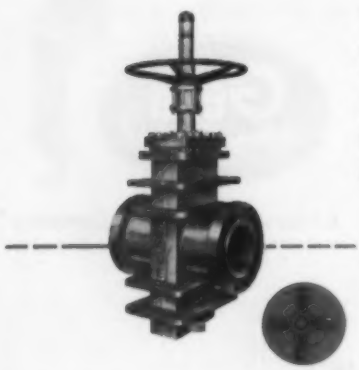
B.F.Goodrich Chemical Company
a division of The B.F.Goodrich Company

B.F.Goodrich

GEON polyvinyl materials • HYCAR rubber and latex
GOOD-RITE chemicals and plasticizers • HARMON colors



You're never stuck with a GROVE VALVE



Here's the valve you set and forget. Grove's exclusive Seal-O-Rings wipe out the need for valve lubrication. You're never stuck with valve failure because of forgotten lubricant or depleted sealing compound. The load of lubrication is gone forever. Specify Grove Seal-O-Ring Gate Valves. Under pressure the tightest seal in the line.

Grove valves never require lubrication

GROVE VALVE and REGULATOR COMPANY

A Subsidiary of Walworth

65th & Hollis Street, OAKLAND 8, California

HOUSTON 27—3203 Mercer St. • LOS ANGELES 6—2559 W. Olympic Blvd.

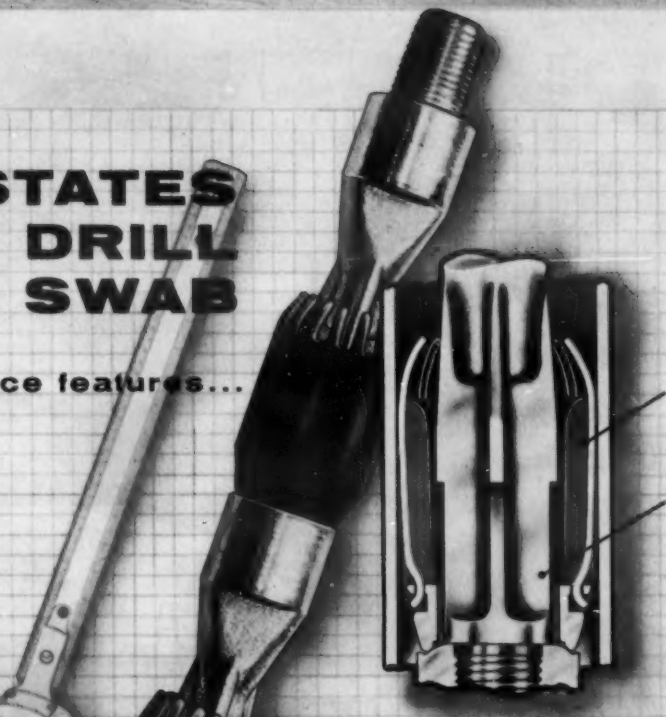
ODESSA • TULSA • DENVER • CHICAGO • NEW YORK • DALLAS • PITTSBURGH

FARMINGTON, N. M. • LAFAYETTE, LA. • HARVEY, LA. • LONGVIEW, TEXAS

In Western Canada: GROVE VALVE LTD., EDMONTON

THE OIL STATES TUBING and DRILL PIPE SWAB

Design and performance features...



OIL STATES SWABS can be unloaded at any time above the fluid column; an important feature in sanding or overloading conditions.

OIL STATES CUPS, made of specially compounded rubber, last longer, with free side-to-side, up-and-down, and rotational movement.

THE ORIGINAL fluted mandrel on OIL STATES SWABS allows free-falling action.

OIL STATES CUPS give positive valving action; no ball and seat to wear; respond to wide range of load conditions.

Sold Through Supply Stores Only

THE OIL STATES TUBING AND DRILL PIPE SWAB

Patent No. 2,466,572 issued April 5, 1949
Patent No. 2,518,275 issued August 8, 1950
Patent No. 2,852,323 issued September 16, 1958
Patent No. 2,862,776 issued December 2, 1958

First marketed design field tested in 1954
First OIL STATES SWAB sold on February 15, 1955

Oil States

LOCATION OF OIL STATES FIELD REPRESENTATIVES

Borger, Texas
Corpus Christi, Texas
Houston, Texas
Odessa, Texas
Wichita Falls, Texas
Casper, Wyoming
Farmington, New Mexico
Great Bend, Kansas
Oklahoma City, Oklahoma

In Canada: Edmonton, Alberta

West Coast Distributor: Monarch Engineering Co. Gardena, California

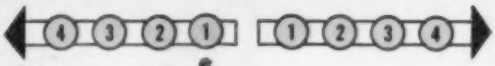
"OIL FIELD RUBBER PRODUCTS OF MATCHLESS QUALITY"

OIL STATES RUBBER COMPANY • ARLINGTON, TEXAS • CR 5-0441

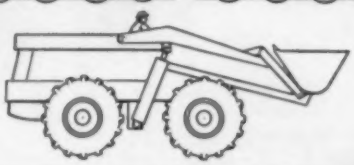
only the HYDRA-DRIVES® BDB

OFFERS ALL THESE MAJOR ADVANTAGES

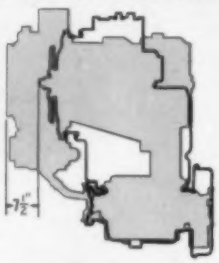
IN FULL-POWER SHIFT TRANSMISSIONS for equipment from 60 to 175 h.p.

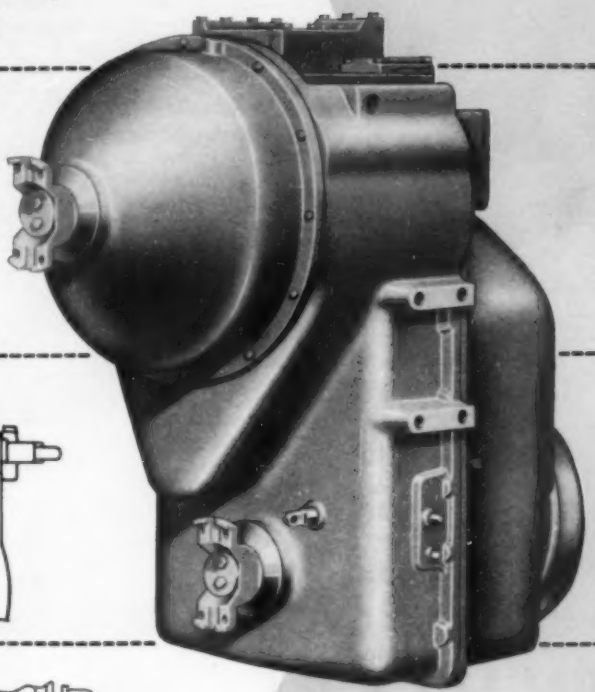


1. **4 speeds forward and reverse.** All power shifted! Provides maximum horsepower to load under all load conditions.

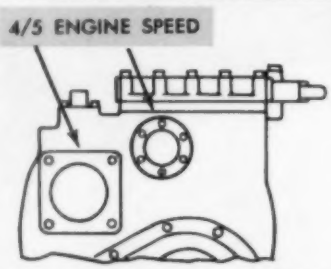


2. **Integral design.** Torque converter, transmission, oil passages, valving and oil sump are in *one* compact housing—7½" shorter than comparable models.

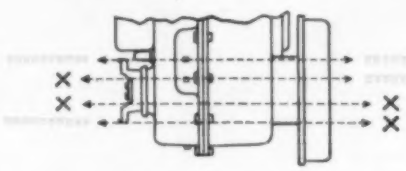




3. **Dual reduced speed pump drives.** Pumps can be driven at engine speed or 4/5 engine speed for longer life and increased horsepower to pump load. Single pump drive is also available.



4. **Full disconnect** provides four combinations of split drive . . . from torque on both shafts, to both shafts in disconnect.



SPECIALLY DESIGNED FOR SMALLER INSTALLATIONS

Rockwell-Standard's new model Hydra-Drives Full Power Shift Transmission is now available in sizes especially designed for smaller installations, such as front end loaders, fork trucks, scrapers, crane carriers, rubber tire tractors and military vehicles.

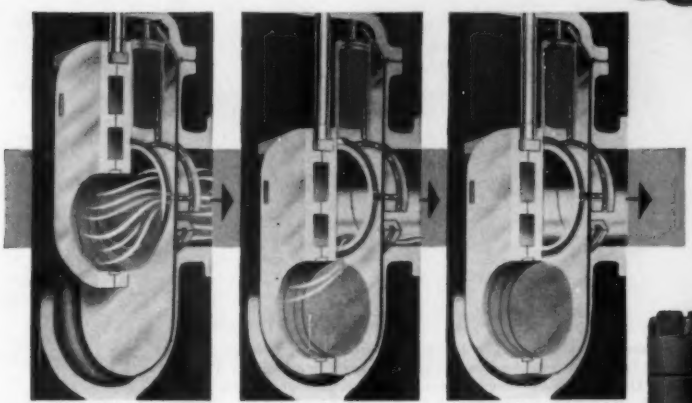
In addition, the Hydra-Drives BDB offers easier servicing and maintenance. There are fewer moving parts and bearings. The simple, rugged countershaft design and spur gears simplify maintenance.

HYDRA DRIVES
ROCKWELL STANDARD CORPORATION
TRANSMISSION AND AXLE DIVISION
DETROIT 32, MICHIGAN

©1959, R-S Corporation

For pipeliners who hate leaks!

DARLING-McEVOY SELF-SEALING CONDUIT VALVES



APPROACHING CLOSURE ... *No loss of sealant as sealing groove in seat is disconnected from reservoir until gate is fully closed.*

CLOSED ... *Jumper in gate now permits differential pressure to feed sealant into seat groove to check any remaining flow.*

AUTOMATICALLY SEALED ... *Pressures again in balance. Tightness established. No additional sealant used until again needed.*

THE DIAGRAMS above show how these unique conduit gate valves seal themselves *automatically* . . . by means of a long lasting reservoir-held sealing compound . . . for leak-proof, pressure-tight closure every time! This feature, with flow in either direction, self-aligning non-wedging gates, and fully protected non-distorting seats, means exceptional performance, utility and service life. For additional information on these fully field-proved Darling-McEvoy valves, ask for Bulletin 5402.

DARLING VALVES

DARLING VALVE & MANUFACTURING CO.

Williamsport 1, Pa.

Manufactured in Canada by Sandilands Valve Manufacturing Company, Ltd., Galt 19, Ontario

Instrument Monitors Corrosion Rates While Equipment Stays on Line

Fastest Known Corrosion Rate Measurement

The *Corrosometer* is its name. It proves the effectiveness of Nalco refinery stream corrosion inhibitors . . . in a hurry. It is the fastest known method of determining corrosion rates in operating equipment; manufactured by Crest Instrument Co. under license from Standard Oil Company (Indiana), and distributed worldwide, by Nalco.

Corrosometer readings are taken quickly and accurately, indoors or out. Instrument leads are attached to probes mounted in corrosion trouble spots. One instrument serves virtually any number of probes.

Coupons, Inspections are Slower

Determining corrosion rates by loss-in-weight methods, using coupons inserted in lines, is a much slower process. Valuable in determining average corrosion rates, it lacks the speed that enables the Corrosometer to reveal immediately any change in corrosion rate caused by process variations. Nalco Representatives, as well as Nalco Corrosion Inhibitor customers and prospects, welcome the speed with which the Corrosometer delivers accurate corrosion rate readings as a real contribution to time and money-saving establishment of good corrosion control practices.

Corrosometer Can Show Day-to-Day Corrosion Rates in System

Readings taken with the Corrosometer show the corrosion rate in the system for a predetermined interval of time. The interval may be as long as desired—or as short as a day or less. Thus checks of Nalco treatment effectiveness, as well as prompt detection of unexpected increases in corrosivity, are practical and accurate with the Corrosometer.

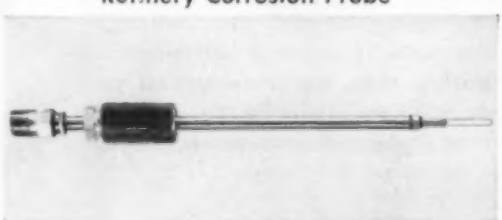
How Corrosometer Works . . .

Utilizing the Kelvin electrical bridge circuit, the Corrosometer compares resistances of two similar probes: one protected from corrosion, the other directly in contact with the liquid or gas in the equipment under test. Corrosion of the unprotected probe increases its electrical resistance, and the difference between probe resistances is directly convertible to corrosion-rate readings of high accuracy.

Retractable probes, for easy replacement without shutting down the system, and probes for high temperature and high pressure systems make the Corrosometer a valuable tool in checking Nalco Results in all types of corrosion-prone equipment.

Your Nalco Representative can give you full details on both the Corrosometer and Nalco corrosion inhibitors. Call him today — or write for descriptive literature.

Refinery Corrosion Probe



Retractable probe can be installed through a gate valve; replaced quickly without taking equipment off line.

NATIONAL ALUMINATE CORPORATION

6242 W. 66th Place • Chicago 38, Illinois

Branches and affiliates in Canada, Germany, Italy and Spain.

Nalco® ***Serving Industry through Practical Applied Science***

Nalco CHEMICALS

The Paul Bunyan of the Oil Fields

THE MIGHTY

LUFKIN

A-1824D-240-62

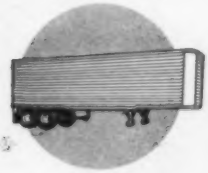
20 FT. STROKE

AIR BALANCED PUMPING UNIT

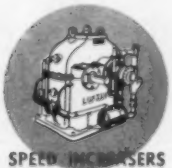
- **Peak Torque — 1,824,000 in. lb.**
- **Stroke — 240 in. maximum**
- **Polished Rod Capacity — 62,000 lb.**
- **Overall Height *(top of stroke)* 46'-10"**

PUMPING UNITS

GAS ENGINES



TRAILERS



SPEED INCREASERS AND REDUCERS

• THERE'S NO PUMPING JOB TOO BIG OR TOO TOUGH FOR *LUFKIN!*

LUFKIN FOUNDRY & MACHINE COMPANY

LUFKIN, TEXAS

Branch Sales and Service | HOUSTON • HATCHEZ • CORPUS CHRISTI • LAFAYETTE • DALLAS • KILGORE • ODESSA • HOBBS • GREAT BEND • DENVER SHREVEPORT • WICHITA FALLS • LOS ANGELES • BAKERSFIELD • EFFINGHAM • CASPER • OKLAHOMA CITY • SIDNEY • MIDLAND FARMINGTON • SEMINOLE • TULSA • NEW YORK • PAMPA • STERLING • MARACAIBO, VENEZUELA • ANACO, VENEZUELA

Lufkin equipment in Canada is handled by THE LUFKIN MACHINE CO., LTD., 9950 89th Avenue, Edmonton, Alberta, Canada, Regina, Saskatchewan, Canada

Another reason why it pays to buy the pipe with the...

Orange Bands

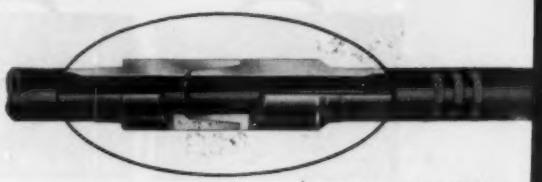
PERFORMANCE PROPERTIES AND SETTING DEPTHS

LIGHTWEIGHT GRADE E DRILL PIPE

SIZE (OD)	INCHES	2⅞"	3½"	4"	4½"	5"
Weight*	Lb./Ft.	6.85	9.50	11.85	13.75	15.0
Wall Thickness	Inches	.217	.254	.262	.271	.296
Tension Data (Minimum Values)						
Load at Minimum Yield	Lbs.	135,900	194,270	230,760	270,030	328,070
Equivalent Length	Ft.	19,840	20,450	19,480	19,640	21,870
Collapse Data (Minimum Values)						
Collapse Pressure	PSI	8,380	8,080	7,080	6,290	6,140
Setting Depth (S.F. = 1⅛)	Ft.	14,900	14,370	12,590	11,180	10,920
Internal Pressure at Minimum Yield	PSI	9,980	9,600	8,660	7,900	7,830

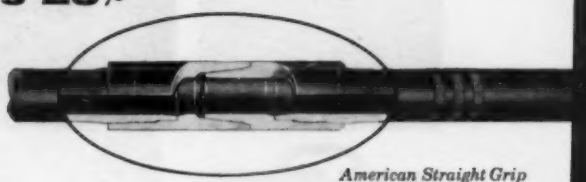
*Transition API Weights

YOUNGSTOWN LIGHTWEIGHT DRILL PIPE

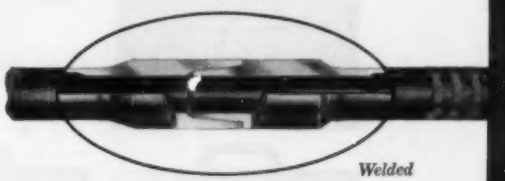


API Counter-bore Weld

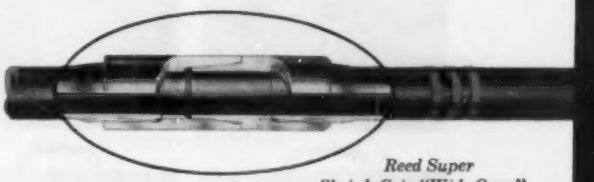
Extends drilling depth, reduces hoisting loads 25% —with your present rig



American Straight Grip

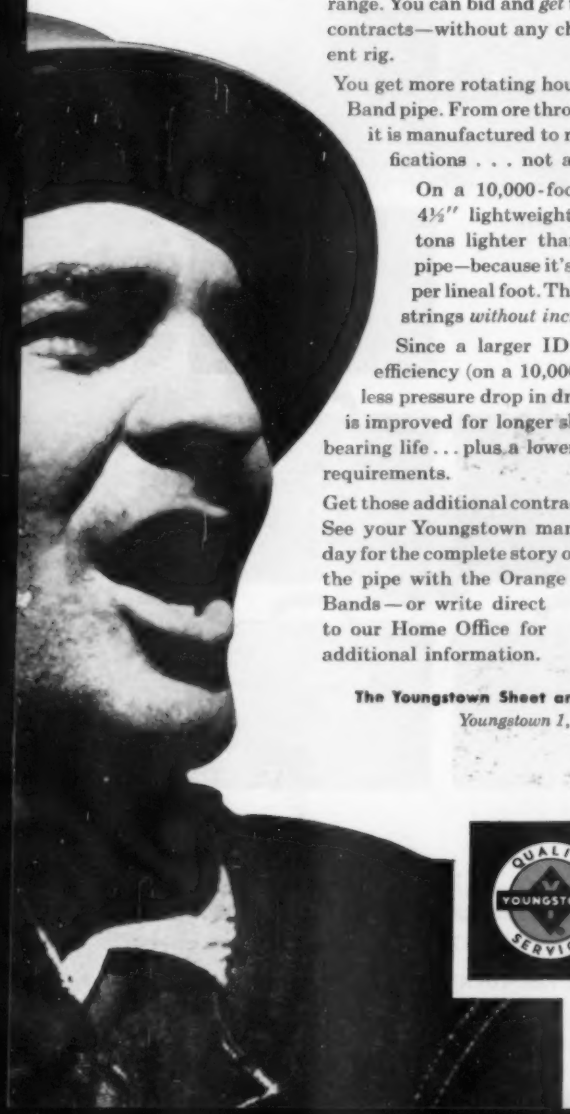


Welded



Reed Super Shrink-Grip "Wide Open"

Hughes Seal Grip



Now, Youngstown provides a lightweight drill pipe that will substantially extend your bidding range. You can bid and *get* those deeper drilling contracts—without any changes in your present rig.

You get more rotating hours with this Orange Band pipe. From ore through final inspection, it is manufactured to rigid drill pipe specifications . . . not a tubing substitute.

On a 10,000-foot hole, a string of 4½" lightweight drill pipe is 14¼ tons lighter than 4½" regular drill pipe—because it's 2.85 pounds lighter per lineal foot. This means longer drill strings *without increased weight.*

Since a larger ID is used, hydraulic efficiency (on a 10,000-foot string, 16.7% less pressure drop in drilling fluid column) is improved for longer slush pump rod and bearing life . . . plus a lowering of horsepower requirements.

Get those additional contracts now. See your Youngstown man today for the complete story on the pipe with the Orange Bands—or write direct to our Home Office for additional information.

The Youngstown Sheet and Tube Company
Youngstown 1, Ohio

Youngstown Lightweight Drill Pipe
Is Available Threaded or Plain End, Internal or External Upset for Attachment with Above Tool Joints.

QUALITY YOUNGSTOWN SERVICE

Youngstown
SEAMLESS DRILL PIPE • CASING • TUBING

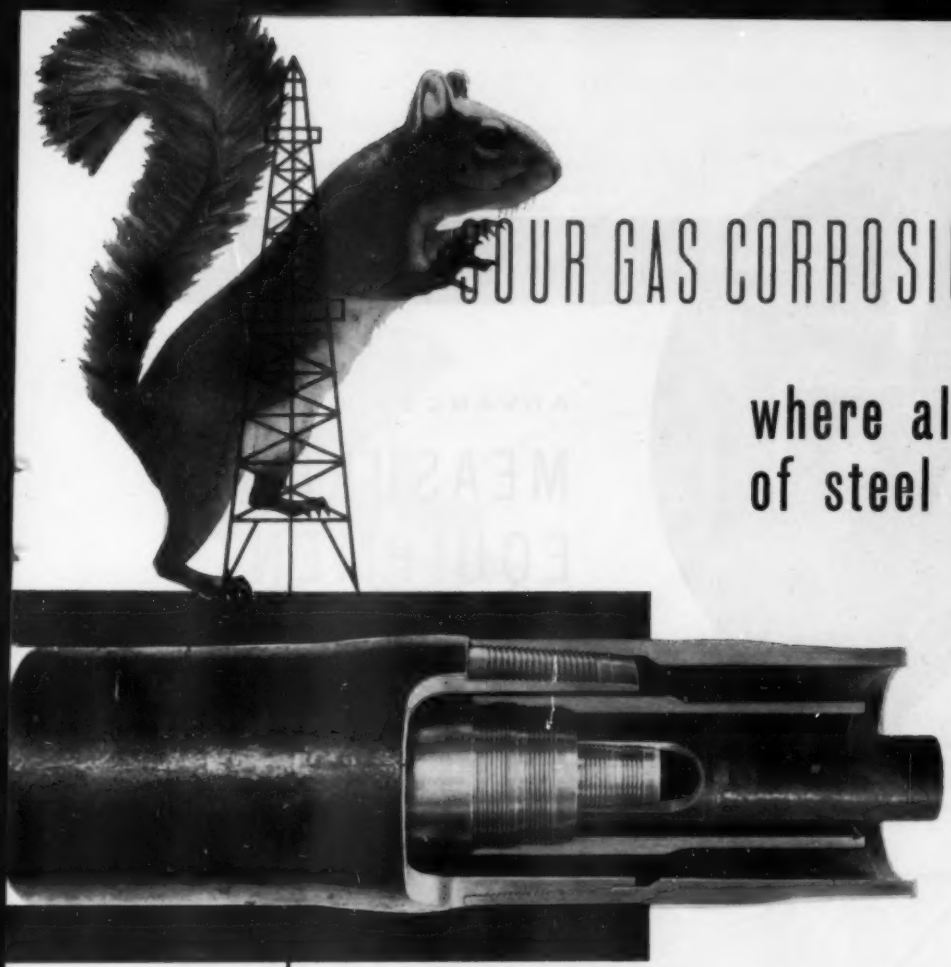
TEIA's case is brief and effective:
25 fully-staffed offices throughout Texas
insure you prompt,
efficient, complete
service.

TEIA

TEXAS EMPLOYERS' INSURANCE ASSOCIATION

FIRST WITH TEXAS INDUSTRY FOR 45 YEARS

AUSTIN F. ALLEN, CHAIRMAN OF THE BOARD | BEN H. MITCHELL, PRESIDENT | HOME OFFICE: DALLAS



SOUR GAS CORROSION MASTERED

where all other types of steel had failed...

The French pipe manufacturers Group, of which Comptoir F.B.T. is the exclusive export department, has solved, for the first time, the most difficult sour gas corrosion problem.

More than 13.000 feet long special steel tubing strings with specially designed high quality joints have produced, for more than three years now, at very high speed, under high temperature and pressure, sour gas containing 15 % H_2S and 6 % CO_2, this without any damage, where all other types of steel had failed.

FBT

COMPTOIR FRANCO-BELGE D'EXPORTATION DES TUBES D'ACIER

64, rue Pierre Charron - Paris 8e (France) - Cable address: Tubacier Paris.

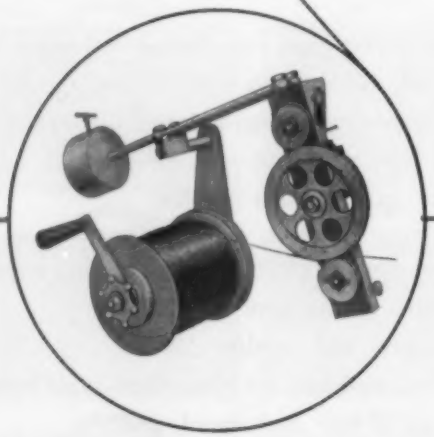
Representatives in every country of the world.

For U.S.A.: apply to Continental Tube Company
1631 Bank of Commerce Building Houston 2, Texas

MEASURES UP . . . TO ALL REQUIREMENTS

ADVANCED DESIGN

MEASURING EQUIPMENT *by* HALLIBURTON



STANDARD MEASURING DEVICE

The basic measuring unit for making well measurements and surveys. Reel Assembly is manually operated; may be power driven from rear wheel of automobile. Unit includes a Standard Measuring Head, Counter Balance Assembly, Reel Assembly, 6000 feet of Measuring Line, two weights, wrench, line ring, hook and box.

HALLIBURTON MEASURING EQUIPMENT IS UNEQUALLED FOR ACCURACY, SIMPLICITY AND EFFECTIVENESS

Proof of performance in any product is its successful use in repeated instances over a long period of time . . . and here's another case where continuous improvement and incorporation of the most advanced design keep Halliburton the unqualified leader in Measuring Devices that meet any or all requirements.

Use any of the variety of types available to give you the accuracy of measurement you must demand to get the best results.

A Halliburton Representative will be pleased to analyze your requirements and help you make your choice, knowing that more than 33 years of uninterrupted quality performance is your guarantee of satisfaction.

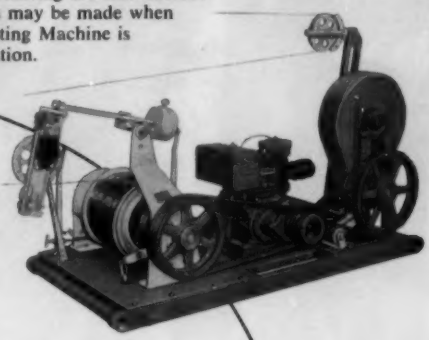
284 SERVICE CENTERS...
TO SERVE YOU BETTER

TWO-WHEEL TRAILER

Provides ample space for even the largest Halliburton Power Driven Measuring Assembly. Specially designed for portability over rugged terrain... light all-steel construction. Overall length of 105 inches. Recommended carrying capacity of 1,500 lbs. Metal cover is optional.

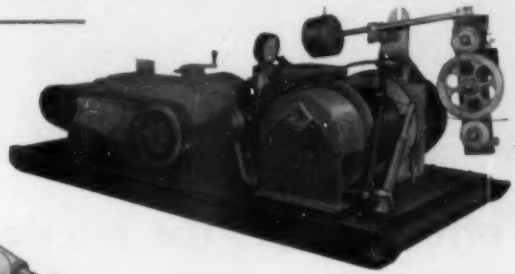
PARAFFIN CUTTING MACHINE

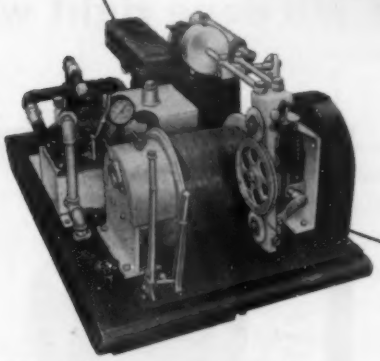
By means of this machine, you can get efficient removal of paraffin from casing or tubing in a producing oil well. Driven by an 8.25 HP Briggs and Stratton air-cooled gasoline engine. Paraffin cutting stroke action is developed by an oscillating arm, engaged by the idler pulley. Length of stroke is adjustable to give vertical travel from 40 to 61 inches. Paraffin Cutting Machine may be operated simultaneously with the Measuring Device. Bottom hole surveys may be made when Paraffin Cutting Machine is not in operation.



EXTRA HEAVY DUTY ELECTRIC MOTOR POWER-DRIVEN MEASURING ASSEMBLY

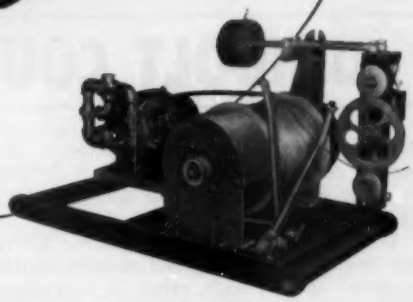
Designed for use where alternating current power is available, this Measuring Assembly incorporates a 5 HP, 220-440 volt, 3 phase, 60 cycle uni-closed electric motor. Explosion proof motor is available, if required, at additional cost. A feature of this unit is the mechanical transmission, with three speeds forward and one speed in reverse, for operations where unusually low line speeds or maximum line pull are required.





HYDRAULIC FLUID-DRIVE POWER-DRIVEN MEASURING ASSEMBLY

Designed for running bottom-hole instruments in the annulus between tubing and casing. Affords more accurate control of the Measuring Line Reel... Reduces to a minimum the hazard of pulling the line in two when a tool or instrument wraps around the tubing or hangs up when coming out of the cased well or open hole.

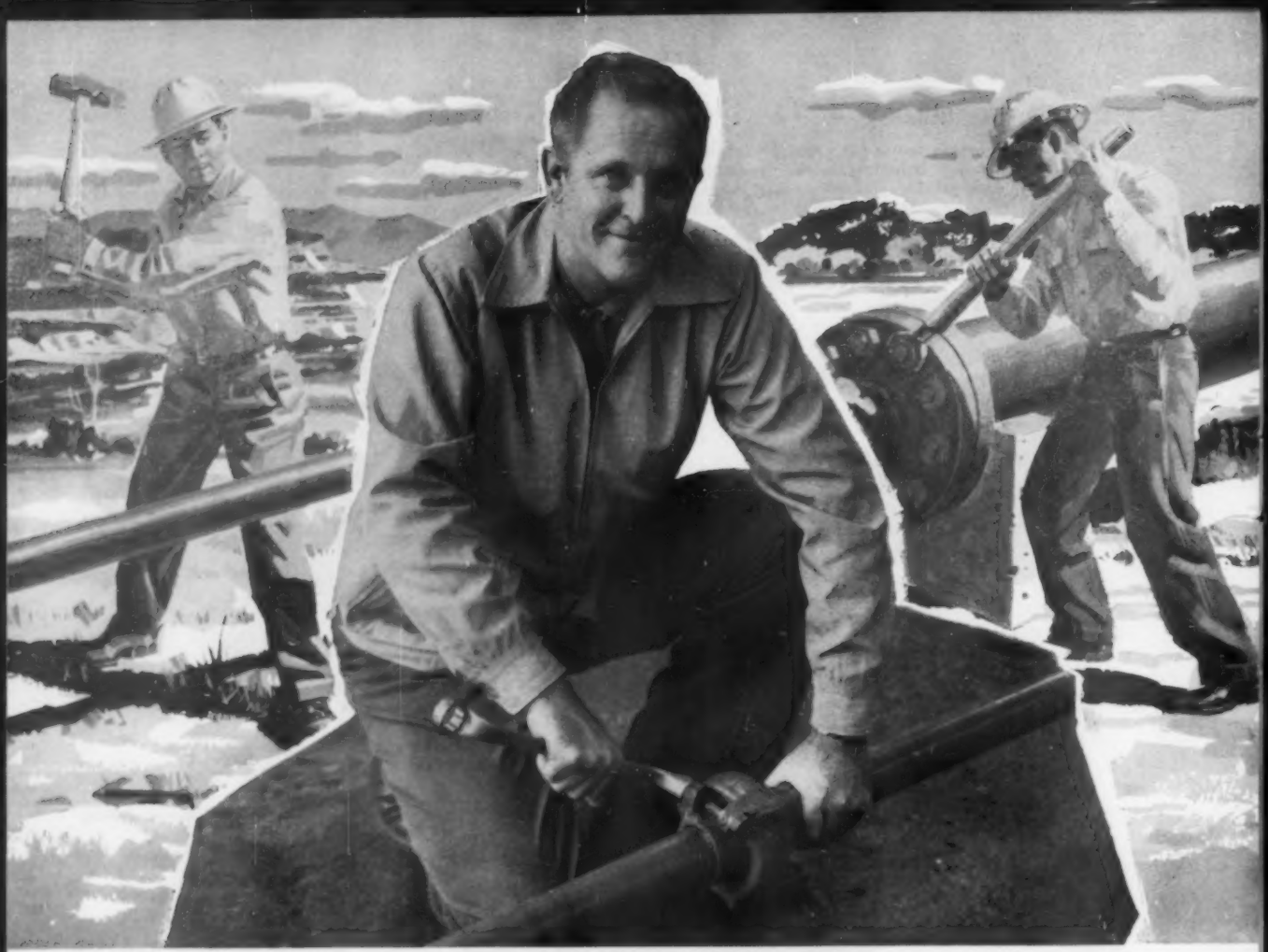


AIR-POWERED MEASURING ASSEMBLY

Driven by compressed air for greater safety and flexibility. Especially suited for well requirements where there is a need for high starting torque, accurately controlled variable speed, or where possible safety hazards exist. Powered by radial 5-cylinder air motor, with built-in gear reduction.

HALLIBURTON MEASURING EQUIPMENT

HALLIBURTON OIL WELL CEMENTING COMPANY • DUNCAN, OKLAHOMA



It takes so little effort to get the job done right with

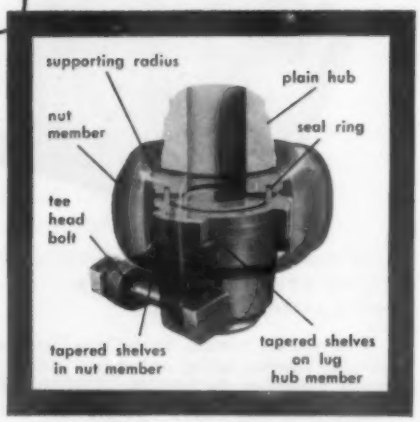
UNIBOLT COUPLINGS

● One man, with a light-weight wrench, can make up or break out the largest size UNIBOLT Coupling (42″) in no time at all and with very little effort. The largest size Coupling requires only two bolts, and sizes up to 5″ are one-bolt design.

The UNIBOLT principle eliminates all threads between the component parts. Instead, tapered shelves on the nut and lug hub members travel against each other in a wedging action when the bolt is tightened. This leverage exerts tremendous pressure on the seats and seal ring.

The UNIBOLT Coupling is stronger than, say, flanged unions because its design places more metal in shear. Yet, it is lighter in weight than other couplings because it is so compact. UNIBOLT Couplings should last indefinitely because they require no destructive hammering for assembly or dismantling. And, their gaskets and seal rings are readily replaceable and obtainable from any supply store.

For any coupling job on threaded, butt weld, or socket weld pipe, or for any pressure vessel closure, UNIBOLT Couplings are your best buy.

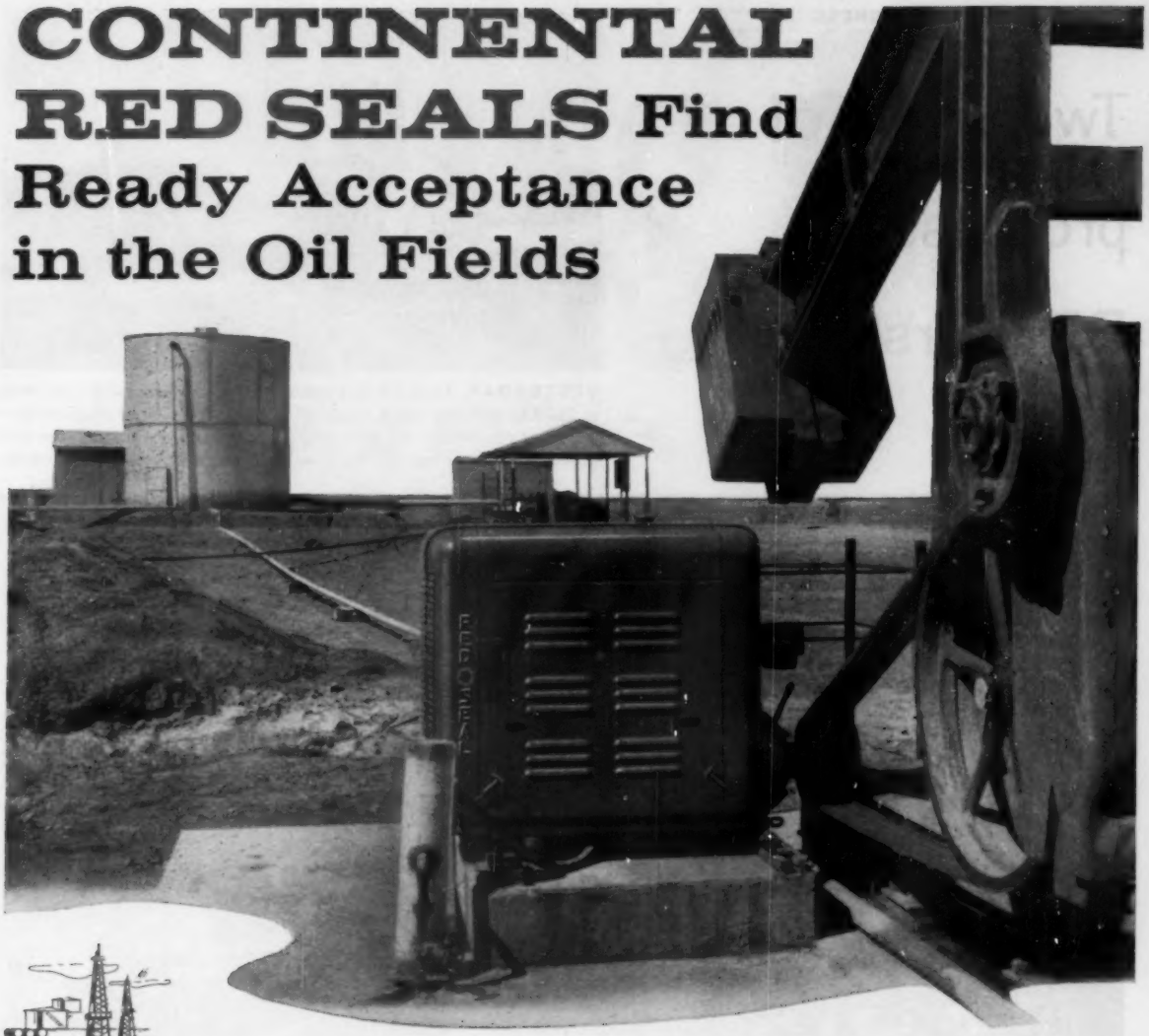


The above drawing shows a UNIBOLT Coupling partially cut away and the nut member in a transparent blue color to reveal the mechanical features of the coupling.

THORNHILL UNIBOLT CRAVER CO.

P. O. Box 1184, Houston, Texas

CONTINENTAL RED SEALS Find Ready Acceptance in the Oil Fields



The ever-widening acceptance of Continental Red Seal engines in all types of oil field operations is attributed in great part to specialization—in Continental's long-standing policy of engineering each model precisely to the job to be done. Each and every model is the product of 56 years' engine-building experience. The industrial series comprises 57 different basic models—from 14 to 237 horsepower—and they are backed by parts and service from coast to coast. Visit your nearest oil field supply store or write the factory for information.

SEE OUR EXHIBIT

MAY 14-23, 1959
Tulsa, Oklahoma

CONTINENTAL MOTORS · Powerful as the Nation · AMERICA'S STANDARD ®

6 EAST 45TH ST., NEW YORK 17, NEW YORK • 3817 S. SANTE FE AVE., LOS ANGELES 58, CALIF.
6218 CEDAR SPRINGS ROAD, DALLAS 9, TEXAS • 1252 OAKLEIGH DR., EAST POINT (ATLANTA) GA.
AND ST. THOMAS, ONTARIO

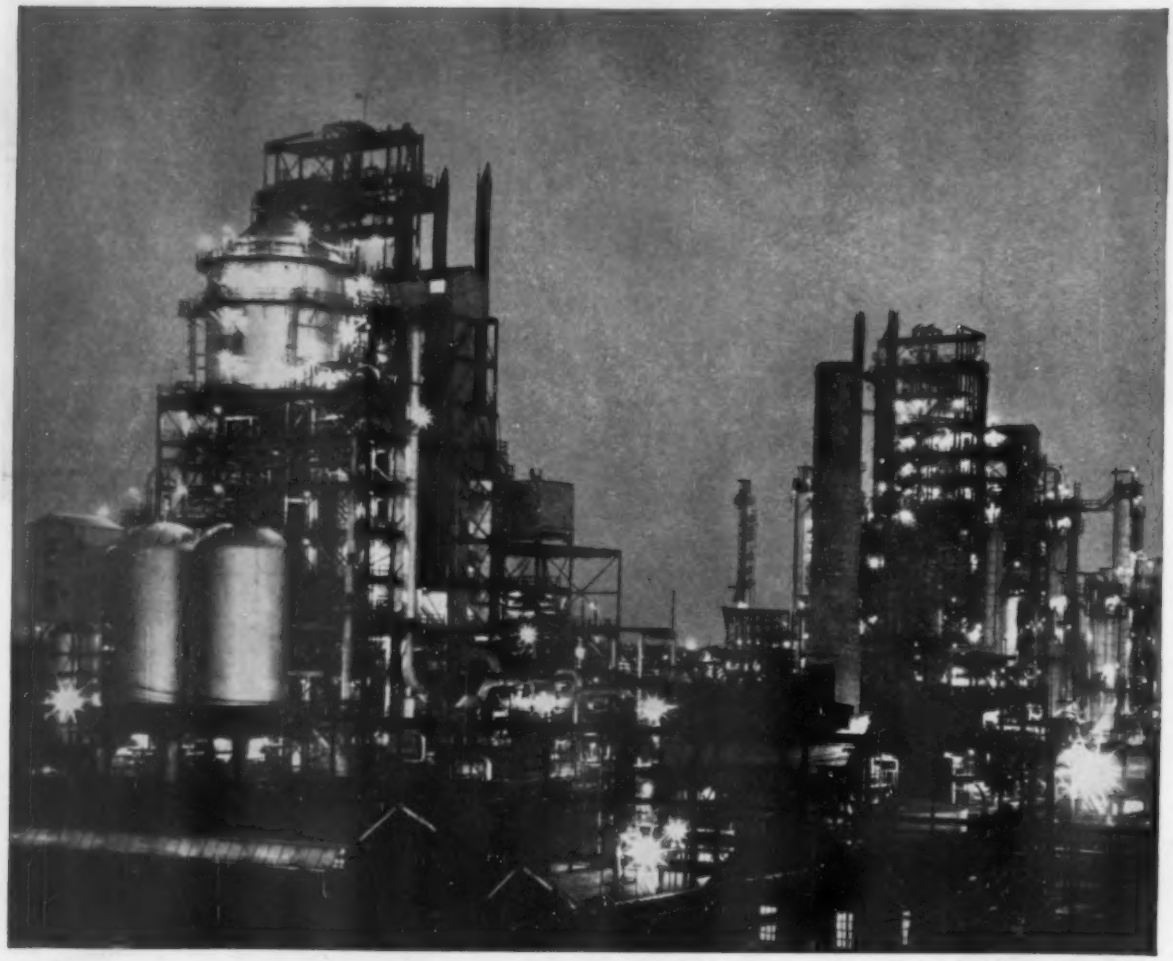
Continental Motors Corporation

MUSKEGON • MICHIGAN

NEWS ON TEXACO PROGRESS

Two views of progress . . . 57 years apart

YESTERDAY. Texaco's first refinery at Port Arthur came into being in 1902 to turn the black crude oil — newly discovered in quantity — into useful products for mankind. Produced in simple stills, the first products were kerosine, naphtha, asphalt and primitive lubricants.



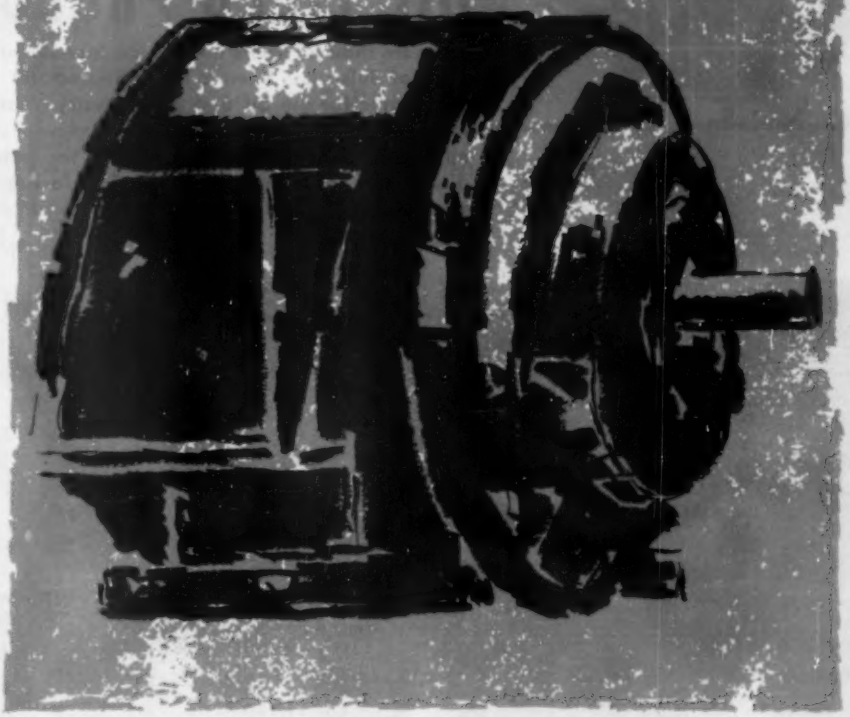
TODAY. At Port Arthur, and at 11 other major Texaco refineries in the United States, ultra-modern chemical wizardry uses many methods to produce constantly improved gasolines, perfected lubricants, and a myriad of other petroleum products. Because these products are so vastly improved, you can drive a more powerful car — jet planes can fly faster and farther — industry can operate more efficiently. And because it has constantly planned ahead, Texaco's growth has been continuous.

TEXACO

. . . CONSTANT PROGRESS IN OIL'S FIRST CENTURY

TULSA

MAY 14-23, 1959



PRESENTING MOTORS AND DRIVES FOR THE OIL INDUSTRY AT THE RELIANCE "R-CADE"

NORTH AREA 206 • OPERATING DISPLAY • AIR CONDITIONED

INTERNATIONAL PETROLEUM EXPOSITION

MASTER REEVES R RELIANCE ELECTRIC AND ENGINEERING CO.

CLEVELAND 17, OHIO

A-1655

More in store for you!

NOW... MID-CONTINENT IS AN AUTHORIZED DISTRIBUTOR IN THE U.S. AND CANADA

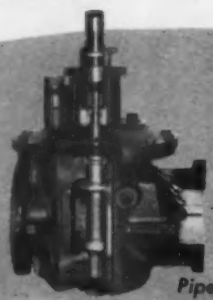
for ENARDO OIL FIELD PRODUCTS

For more than 25 years the Enardo Manufacturing Company of Tulsa has been a key manufacturer of quality accessories for the oil and gas industry. Mid-Continent is now proud to offer its customers this line of engineered oil field specialties for all phases of the petroleum industry. For the complete line of Enardo products, visit your local Mid-Continent store or see your Mid-Continent representative.

PRODUCTION

- Slip-on Fittings and Couplings
- Production Rate Recorders
- Automatic Samplers

4-Way Economy Valve



PIPE LINE

- Service Patch and Sleeve Clamps
- Programming Clocks
- Time Cycle Switches

Pipeline Shut-Off Valve

VAPOR CONSERVATION

- Thief Hatches
- Sample Boxes
- Liquid Level Indicators
- Air Lock Switchers

In-line Vent Valve

PROCESSING

- Motor Control Valves
- Liquid Level Controllers
- Pressure Controllers
- Hi-Lo Shut Down Valves

Blo-Down Safety Valve

EN1-9

MID-CONTINENT SUPPLY CO.

MID-CONTINENT BUILDING • FORT WORTH, TEXAS

Export Division: 45 Rockefeller Plaza, New York 20, N. Y. Cable: MIDCUMPORT NYK

THE WORLD'S LARGEST INDEPENDENT OIL FIELD SUPPLY COMPANY

In Petroleum and Petrochemical Engineering

PARSONS

means "Specialized Versatility"

Repeat business has played a vital role in establishing Parsons as a leader in the engineering-construction field. Satisfaction with Parsons' performance, on all kinds of petroleum and chemical facilities, has brought repeat assignments on job after job—time after time. When you think of engineering or construction, think of Parsons, and you too will realize that

PARSONS MEANS "SPECIALIZED VERSATILITY"

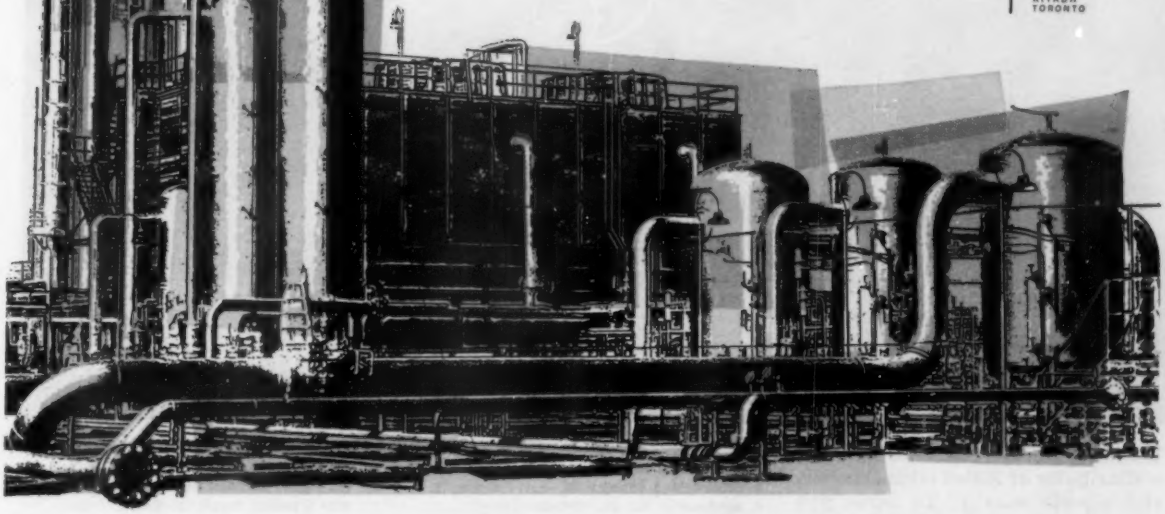
THE RALPH M. PARSONS COMPANY

HOUSTON
NEW YORK
PASADENA
WASHINGTON

ENGINEERS • CONSTRUCTORS

LOS ANGELES

ANKARA
ASMARA
BAGHDAD
DACCA
JEDDAH
KARACHI
NEW DELHI
PARIS
RIYADH
TORONTO



PARSONS

FACILITIES OPERATION

PETROLEUM AND CHEMICAL ENGINEERING

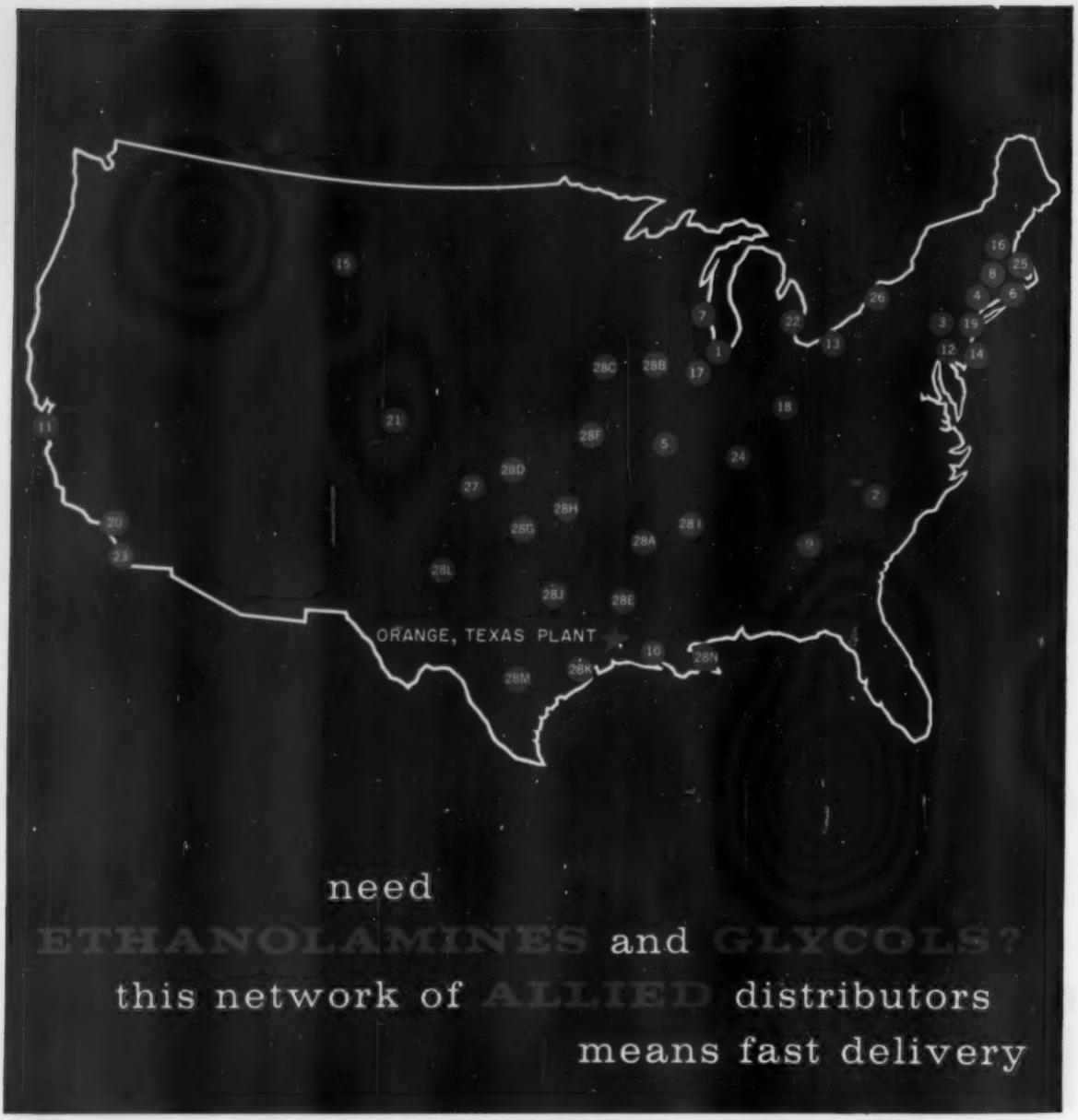
CONSTRUCTION

ARCHITECT-ENGINEERING

ELECTRONICS

WATER DEVELOPMENT AND SYSTEMS

EVALUATION AND ECONOMICS



need
ETHANOLAMINES and GLYCOLS?
this network of ALLIED distributors
means fast delivery

Wherever you are, chances are there's a distributor of Allied ethanolamines and glycols nearby. To serve you promptly and economically, local drum stocks are maintained by the distributors listed at right. Drum and tank car quantities are also available from Allied's Orange Texas plant. Shouldn't you make a note right now of the source nearest you?

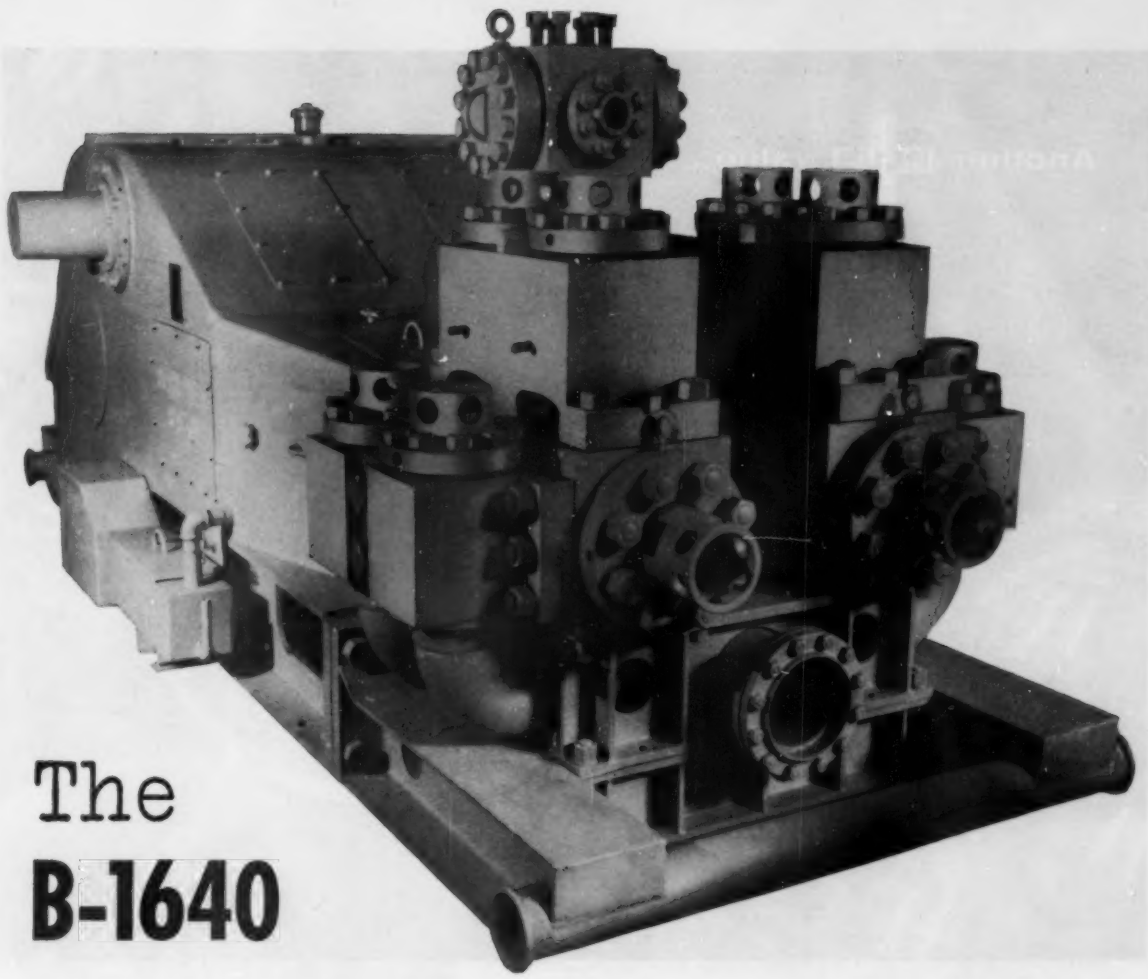
1. **Acid Products Co., Inc.**—Chicago, Ill.
2. **Acme Soap & Chemical Co.**—Charlotte, N. C.
3. **Aetna Color & Chemical Co.**—East Paterson, N. J.
4. **Apothecaries Hall Co.**—Waterbury, Conn.
5. **Harry A. Baumstark & Co.**—St. Louis, Mo.
6. **T. H. Baylis Co.**—Providence, R. I.
7. **Benlo Chemicals**—Milwaukee, Wisc.
8. **Chemical Sales & Service Co.**—Worcester, Mass.
9. **Chemical Services, Inc.**—Atlanta, Ga.
10. **Coastal Chemical Co.**—Abbeville, La.
11. **Cole & De Graf**—San Francisco, Calif.
12. **Geo. S. Coyne Chemical Co.**—Philadelphia, Pa.
13. **Crowley-Thompson Chemical Co.**—Cleveland, Ohio
14. **Heinrich Corp.**—Delawanna, N. J.
15. **Dyce Sales & Engineering Service Co.**—Billings, Mont.
16. **Freeport Chemical Distributors**—Cambridge, Mass.
17. **Great Lakes Chemical Co.**—Cicero, Ill.
18. **Herbert Chemical Co.**—Cincinnati, Ohio
19. **Independent Chemical Co.**—Brooklyn, N. Y.
20. **Los Angeles Chemical Co.**—South Gate, Calif.
21. **Mine & Smelter Supply Co.**—Denver, Colo.
22. **O'Connor Chemicals, Inc.**—Detroit, Mich.
23. **Pacific Polymers**—Hawthorne, Calif.
24. **P B & S Chemical Co.**—Henderson, Ky.
25. **Plyco Products, Inc.**—E. Boston, Mass.
26. **Riverside Chemical Co.**—No. Tonawanda, N. Y.
27. **Southwest Gas Equipment Co.**—Liberal, Kan.
28. **Thompson-Hayward Chemical Co.** (All offices listed below are Thompson-Hayward)

28A—No. Little Rock, Ark. 28B—Davenport, Ia. 28C—Des Moines, Ia. 28D—Wichita, Kan. 28E—Shreveport, La. 28F—Kansas City, Mo. 28G—Oklahoma City, Okla. 28H—Tulsa, Okla. 28I—Memphis, Tenn. 28J—Dallas, Texas. 28K—Houston, Texas. 28L—Lubbock, Texas. 28M—San Antonio, Tex. 28N—New Orleans, La.

BASIC TO AMERICA'S PROGRESS

Allied Chemical

NITROGEN DIVISION
Dept. GA 4-55-3, 40 Rector St., New York 6, N. Y.



The B-1640

—with a new all-forged-steel fluid end!

Especially designed to increase deep-jet penetration rates, the fluid end of Bethlehem's B-1640 slush pump is now made entirely of forged alloy steel. More rugged, more versatile than ever, this new fluid end permits greater volume at higher pressures. With its bolted-on units, valve pots and cylinders are freely interchangeable—even reversible. Pistons can be replaced without removing liners or cylinder heads. And alternate positions are available for the discharge connections.

Other features, too, add to the performance of the mighty B-1640. Witness its all-steel weldment power-end frame with double-wall construction—its forged alloy-steel gears and shafts—its high-capacity roller bearings and oil-bath lubrication.

In power, reserve, and economy of operation, the B-1640 leads the field. Call or write for complete information.

B-1640 Performance Data

Max volume (gpm) . . . Max pressure (psi) . . . Max input hp (ihp)
(Based on 100 pct volumetric and 85 pct mechanical efficiencies)

Liner sizes, in.		8	7½	7	6½	6
Vel. per crank rev., gal		12.59	10.91	9.33	7.86	6.50
Crank rpm						
50	gpm	630	546	467	393	325
	psi	2,570	2,920	3,360	3,900	4,570
	ihp	1,111	1,093	1,076	1,052	1,020
60	gpm	755	655	560	472	390
	psi	2,570	2,920	3,360	3,900	4,570
	ihp	1,333	1,312	1,291	1,262	1,223
70	gpm	881	764	653	550	455
	psi	2,570	2,920	3,360	3,900	4,570
	ihp	1,555	1,530	1,506	1,473	1,427
80	gpm	1,007	873	764	629	520
	psi	2,570	2,920	3,360	3,900	4,570
	ihp	1,777	1,749	1,722	1,683	1,631
90	gpm	1,133	982	840	707	585
	psi	2,570	2,920	3,360	3,900	4,570
	ihp	1,999	1,967	1,937	1,894	1,835

BETHLEHEM STEEL COMPANY • Supply Division
General Offices: 21 E. Second St., Tulsa, Okla.
West Coast: BETHLEHEM PACIFIC COAST STEEL CORP.
Supply Division: Los Angeles, Calif.
Canadian Distributor: Bethlehem Supply Company of Canada, Ltd., Calgary, Alberta, Canada
Export Distributor: Bethlehem Steel Export Corporation, 25 Broadway, New York, N. Y.

BETHLEHEM STEEL • SUPPLY DIVISION

OIL HOLES FOR LONGEST WEAR LIFE

Effective penetration of lubricant into the working parts of an oil field roller chain is vital for long wear life. In Rex Oil Field Roller Chains this *plus* value is assured because every chain in the line has scientifically designed and sized oil holes in the bushings to provide easy distribution of lubricant to the points where it's needed.

This feature and the correctly designed built-in clearances enable the lubricant to protect the chain against premature failures due to wear and "galling" of parts. For longest wear life ...highest fatigue strength, get the chains that give you ALL the *plus* values: Rex Roller Chains. Available in GLIDE-FIT (cottered) and DRIVE-FIT (riveted) styles. CHAIN Belt Company, 4619 W. Greenfield Ave., Milwaukee 1, Wis.

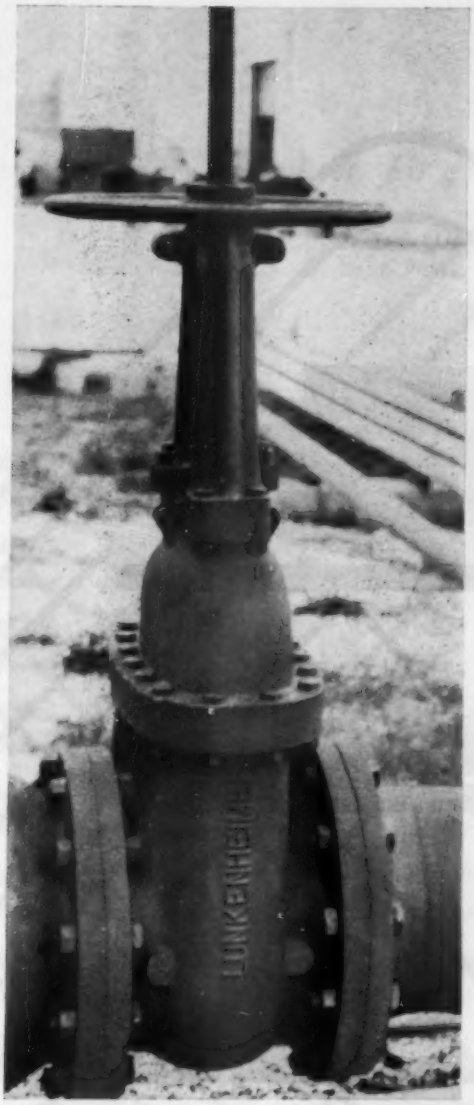
Get ALL the Plus Values

- Pitch control
- Guide-pierced and ball-swaged link plates
- Built-in beneficial stresses
- Positioned seam bushings
- Oil holes for effective lubrication
- Gap-free round rollers
- Roll pin fasteners...proved best

For Highest Fatigue Strength ...Longest Wear Life

REX® OIL FIELD ROLLER CHAINS

Oil Field Offices: Dallas • Houston • Los Angeles • Odessa • Oklahoma City • New York. Export Offices: Milwaukee • New York



TO KEEP MAINTENANCE COSTS DOWN . . .

New GREX Plant "Goes On Stream" with Lunkenheimer Valves

When W. R. Grace & Co.'s new multi-million dollar GREX plant at Baton Rouge, La.*, went into operation, another 50 million pounds were added to domestic high-density process polyethylene capacity.

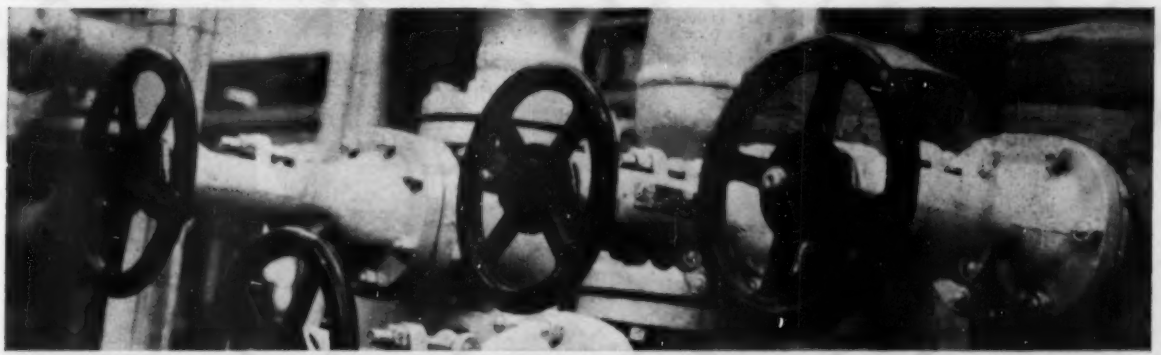
Lunkenheimer Valves were placed in various production units throughout the plant. Thanks to sound planning, valve maintenance expense will be kept to a minimum . . . because, part-for-part, Lunkenheimer Valves provide longer maintenance-free performance than any other valves.

In manufacturing, institutional and commercial buildings all over the world—Lunkenheimer Valves have established unmatched performance records for almost a century. When you can specify Lunkenheimer at no extra cost, why settle for anything less than the best?

We would appreciate the opportunity to make specific recommendations for maintenance-saving Lunkenheimer Valves in your new project or on your manufactured equipment. Write The Lunkenheimer Co., Cincinnati 14, Ohio.

*Engineered and built by: The Fluor Corporation, Ltd., Los Angeles, Calif.

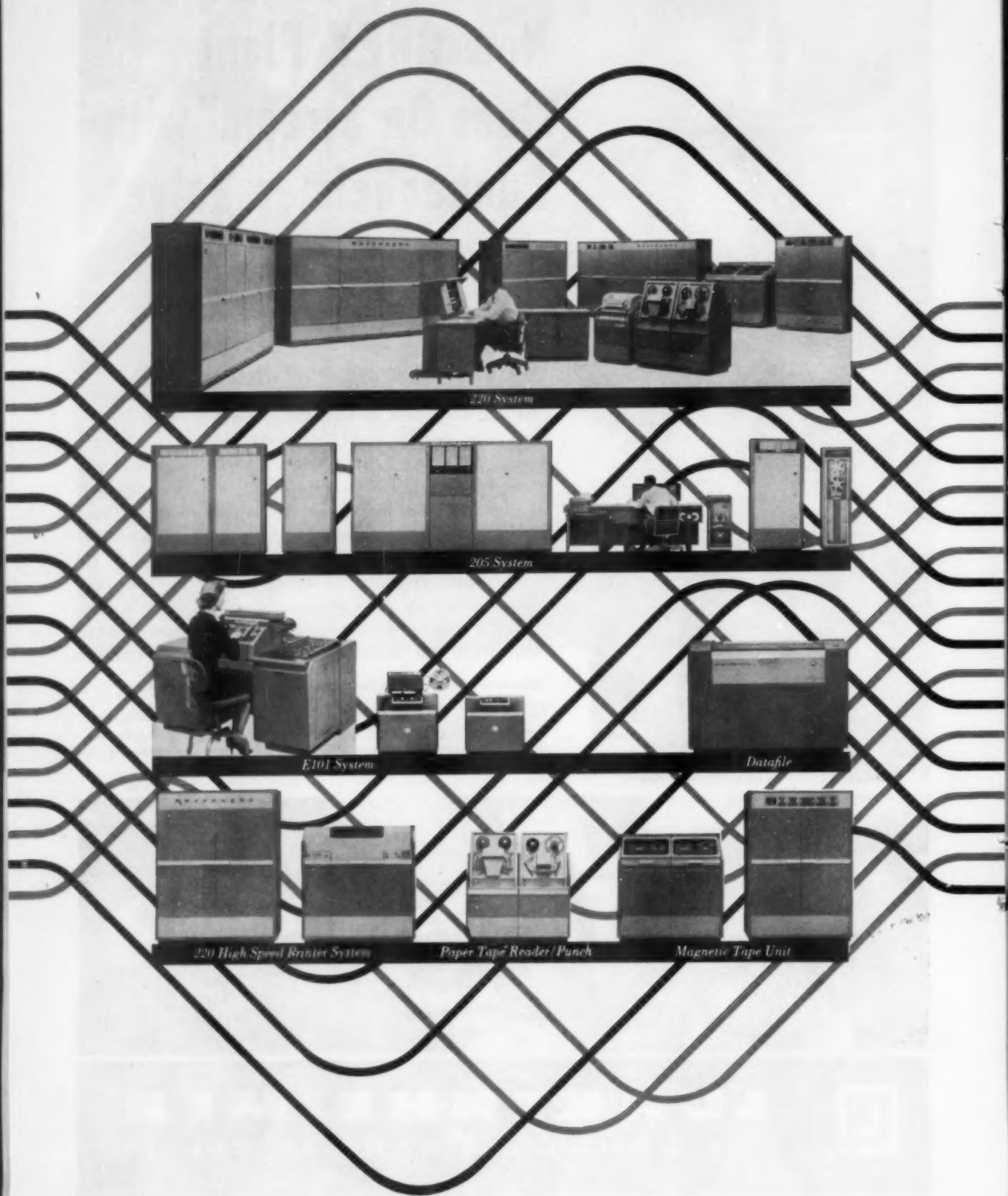
Lunkenheimer All-Iron Gate Valves are used extensively throughout the new GREX plant. *Machined Guides*, another Lunkenheimer exclusive, eliminate chatter and reduce wear! *True-solid Discs* are unaffected by temperature variations!



LUNKENHEIMER QUALITY

LUNKENHEIMER®

THE ONE *Great* NAME IN VALVES


220 System
205 System
E101 System
Datafile
220 High Speed Printer System
Paper Tape Reader/Punch
Magnetic Tape Unit

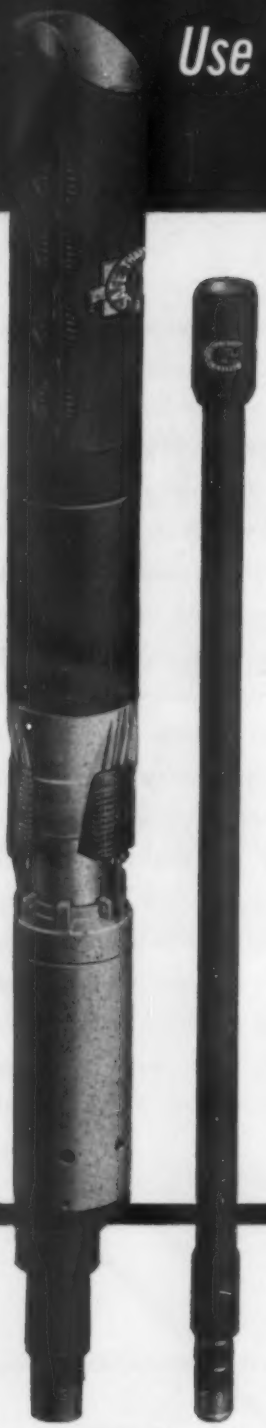
expandable for growing needs:
a full range of Burroughs electronic computers
for science and business

From advanced computer systems to individual computer components... the Burroughs line of electronic data processing equipment spans a full range of varied requirements for both scientific and business applications. • Start at the top if your needs call for giant computer ability: The *Burroughs 220,* first and only available medium-priced computer with expandable magnetic core storage... a powerful multi-purpose system which can grow with your computational requirements. The *220* is now at work and delivering effective results at the lowest application cost. • If present application demands are more moderate, investigate the versatile *Burroughs 205.* First in its field with external magnetic tape storage... complete choice of input/output media with flexible, modular expansion, top capacity and speed. The *205* has thoroughly proven its economic value in a wide variety of scientific and business applications. • Most popular of all low-cost computers is the *Burroughs E101.* Exclusive, simple pinboard programming frees engineering man hours, by reducing manual computation time up to 95%. Machine ability is further extended by optional punched paper tape input/output equipment and new punched card input unit. • Burroughs advanced sub-systems include: *Datafile* magnetic tape unit with vast external storage capacity... up to 50-million digits per unit; *Cardatron*... fastest, most powerful card handling system; *220 High Speed Printer System* ...a transistorized unit with unmatched speeds up to 1500 lines per minute, on-line or off-line operation. *High Speed Photoreaders, Magnetic Tape Units* and other computer system components are also finding wide use in data processing, communications and allied fields. • Currently in production, all these Burroughs products are designed to meet your growing data processing needs... and supporting the entire Burroughs line is an outstanding team of computer specialists for efficient, on-the-spot, technical assistance. Write today for brochure, specifying system or component. • ElectroData Division, Pasadena, California.

Burroughs Corporation *"NEW DIMENSIONS/in electronics and data processing systems"*

For Dual String Completions – Flowing or Pumping

Use GUIBERSON'S RETRIEVABLE TYPE RD PACKER



Type RD Packer with Anchor and Plain Stinger

This cleanly designed, rugged packer is an outstanding Guiberson development for dual string installations in wells of any depth.

Outstanding in performance because it operates perfectly with both zones flowing, high or low differential pressure; with either zone flowing, the other zone pumping; with both zones pumping; with either or both zones on gas lift; or for multi-zone injection — gas or water.

Outstanding in advantages because it completely isolates each zone from the other and from the casing; provides full opening long string to lower zone; permits either string to be pulled or run separately.

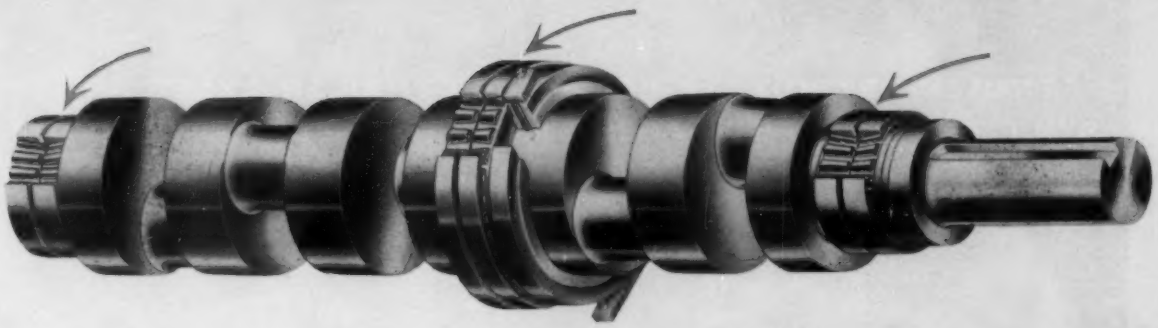
Guiberson's RD packer does complex dual zone jobs so well that operators tell us it's their best investment for dual string production. Ask your Guiberson representative about installation and auxiliary equipment recommendations.

Guiberson's RD packer has smooth operating dovetail slips of heat-treated alloy steel. Packing rubber is one-piece sleeve type — will not vulcanize in the well, made of Guiberson's special oil and gas resistant compound. You can get the RD packer with or without anchor, and a choice of stingers, plain or with snap-ring. Piston slips have extra large gripping area, are heat-treated alloy steel and keyed to anchor body up to maintain proper alignment. Get the Best — Get Guiberson.

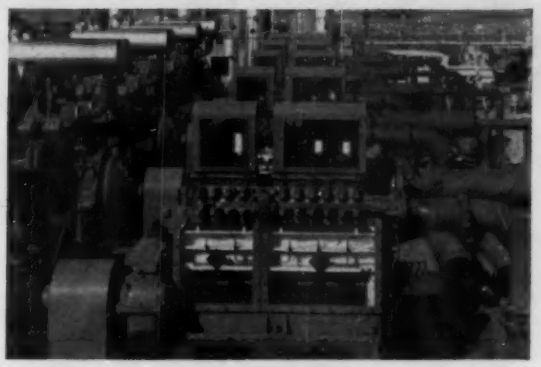
THE GUIBERSON CORPORATION

ESTABLISHED 1919
DALLAS, TEXAS
U. S. A.

Sold by Oil Field Supply Stores Everywhere



Get smoother, maintenance-free operation...



on first quintuplex pump to use 3 double-row tapered roller bearings

...Timken® bearings, of course

WHEN Ajax Iron Works designed this quintuplex pump, it was an important first in the field. They use three double-row tapered roller bearings on the crankshaft to get smoother operation, eliminate field adjustment. And they're *Timken*® bearings. The double-row Timken bearings are naturals for the steady, heavy-duty work of the most severe oil field and industrial pumping. And like all Timken bearings, they assure longer bearing life and practically maintenance-free operation. Here's how they do it.

1) Timken bearings take *both* radial and thrust loads. Their tapered construction does it. They hold shafts in positive alignment, minimize deflection and end play.

2) Designed and precision-made to have true rolling motion, Timken bearings practically eliminate friction. They *roll* the loads.

3) By holding shafts concentric with housings, Timken bearings make closures more effective in keeping lubricant *in*, dirt, dust and moisture *out*.

4) Because steel is the heart of a bearing, we use only the finest. We make it ourselves to be sure. No other American bearing maker does.

To get better machines, make sure they're equipped with Timken tapered roller bearings. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable: "TIMROSCO". *Makers of Tapered Roller Bearings, Fine Alloy Steels and Removable Rock Bits.*

WHEN YOU BUY TIMKEN® BEARINGS YOU GET...

1. Quality you can take for granted
2. Service you can't get anywhere else
3. The best-known name in bearings
4. The pace setter in lower bearing costs

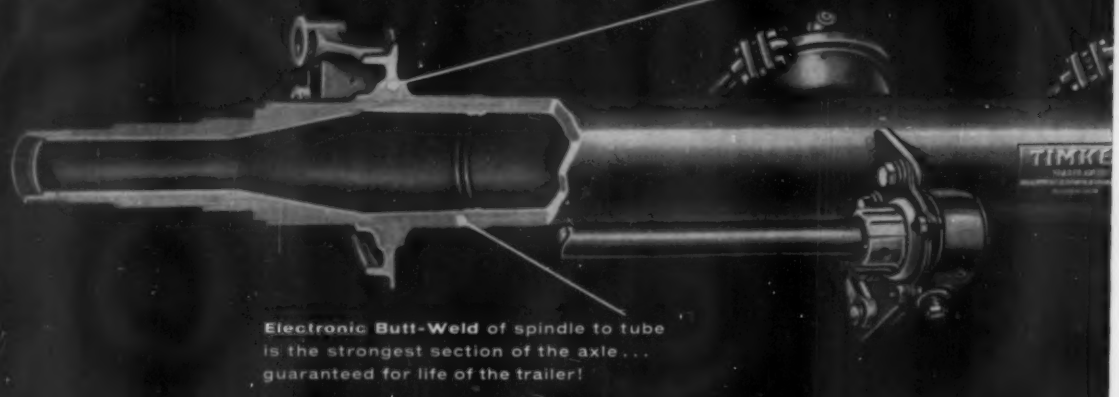
BETTER-NESS rolls on

TIMKEN®

First in bearings for 60 years

tapered roller bearings

TIMKEN-DETROIT TK-500 SERIES TRAILER AXLES ARE STILL THE LIGHTEST, SAFEST, MOST RUGGED YOU CAN BUY!


Rugged One-Piece Forged Steel Brake Spider is electronically welded to axle for lighter weight and better brake performance.
Electronic Butt-Weld of spindle to tube is the strongest section of the axle . . . guaranteed for life of the trailer!

often imitated... but never equaled!

Every TK-500 Series Trailer Axle is "torture-tested" for safety.

Exclusive alloy steel spindles are upset forged and hot-pierced for greater strength at less weight.

One-piece forged alloy steel brake spider is practically indestructible . . . gives rigid brake support and never needs replacing.

©1959, R-S Corp.

Huge Rockwell designed welding machines electronically butt-weld the spindles to the seamless tubular section, making this the strongest section of the axle.

Only Rockwell-Standard has the facilities to perform these operations. Backed by 50 years of axle pioneering and billions of miles of trouble-free service, Rockwell-Standard is the accepted standard for the industry.

For maximum safety, less maintenance and more payload, specify and insist upon the Timken-Detroit TK-500 . . . *there is no equal.*

Another Product of... **ROCKWELL-STANDARD CORPORATION**

ROCKWELL R STANDARD®

Transmission and Axle Division, Detroit 32, Michigan

THE NATIONAL NSCO SUPPLY COMPANY

Only the best get this stencil

In the plant where we manufacture Spang Tubular Products, one out of every five men is an inspector. So when the product gets this stencil, we *know* it's the best. You can count on it—long after the trademark is worn off.

On the next pages:
SPANG Extreme Line Tubing

Why SPANG Extreme Line Tubing is best for deep, high pressure wells

Name the tubing features you need for profitable completions in deep, high pressure wells—and you'll find that Spang Extreme Line Tubing has every one! Take make-up and running speed, for example. Wide, rugged, modified Acme threads provide fast joint make-up with minimum possibility of cross threading and maximum speed in running. Couplings are eliminated, and the integral type joint of Spang Extreme Line reduces threaded connections 50%.

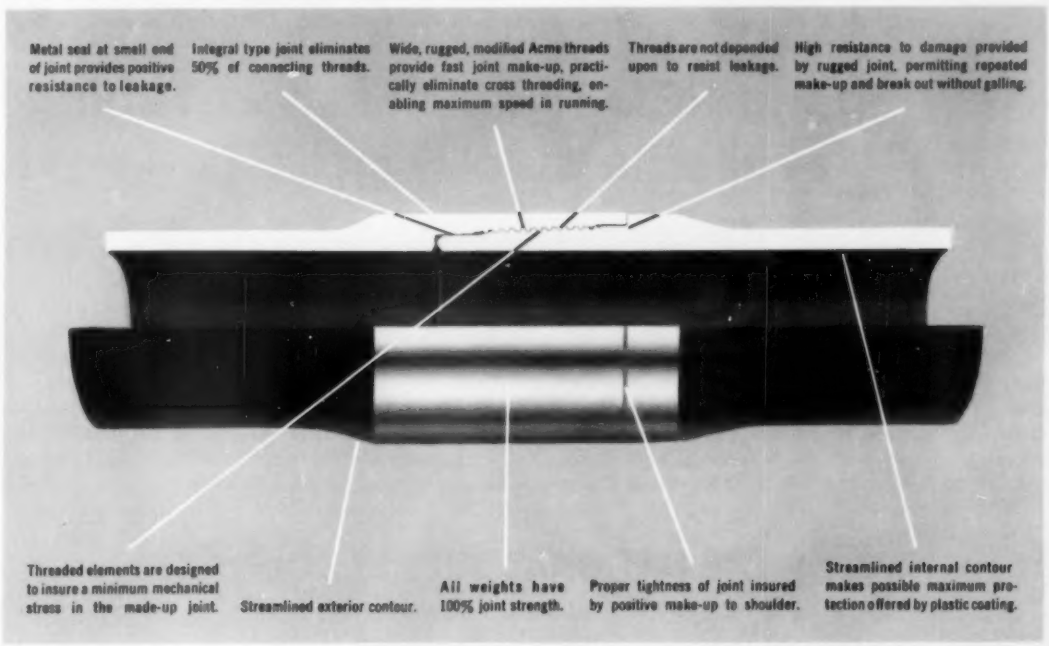
Need 100% leakage resistance? You get it with Spang. Male and female members make up into a sealed joint that is shoulder tight, and this unique seal resists leakage even under extreme conditions. The Spang Extreme Line joint is streamlined internally and externally with a minimum outside diameter.

Because of its streamlined exterior, Spang Extreme Line greatly minimizes the possibility of hanging up when running or stripping under pressure. The joint strength is 100% in all weights—its ruggedness permits repeated making up and breaking out without galling.

Spang Extreme Line Tubing is available in grades J-55, N-80, and P-105 to meet every well condition, and—if you anticipate paraffin accumulation or corrosion problems—you can order Spang's plastic coating to combat it (more about this on the next page). Spang Extreme Line Tubing is especially suited for deep, high pressure wells.

Next time you need tubing, be sure you get the best. Buy Spang Extreme Line Tubing or Spangseal Tubing.

Couplings are eliminated in this superior, 100% leak-resistant joint!


Metal seal at small end of joint provides positive resistance to leakage.
Integral type joint eliminates 50% of connecting threads.
Wide, rugged, modified Acme threads provide fast joint make-up, practically eliminate cross threading, enabling maximum speed in running.
Threads are not depended upon to resist leakage.
High resistance to damage provided by rugged joint, permitting repeated make-up and break out without galling.
Threaded elements are designed to insure a minimum mechanical stress in the made-up joint.
Streamlined exterior contour.
All weights have 100% joint strength.
Proper tightness of joint insured by positive make-up to shoulder.
Streamlined internal contour makes possible maximum protection offered by plastic coating.

On the next page: New SPANG Red Plastic Coating for Tubing!

◀ The joint design of Spang Extreme Line Tubing insures fast make-up, with minimum possibility of cross threading and maximum speed in running. Joint strength is 100% in all weights.

The new red plastic coating is approximately half as thick as the familiar green which has been used successfully for a number of years. National has the only mill facility of its kind for the unified control of tubular goods and plastic coating.

New Spang RED Plastic Coated Tubing available at lower cost!

You asked for a lower cost Spang Plastic Coated Tubing to minimize paraffin deposits—and here it is. Spang RED Plastic Coating is made of the same tough epoxy-phenolic plastic as the familiar GREEN. The only difference is that it's approximately half as thick as the GREEN.

Like the thoroughly proven GREEN coating, the new RED coating is applied to a shot-blasted surface by alternate spraying and baking until the lining of predetermined thickness is obtained. The result is a hard, smooth lining which effectively resists paraffin deposition. (Field experience shows SPANG Plastic Coated Tubing eliminates 50% to 75% of the costly paraffin removal jobs required when uncoated tubing is used.)

We will continue to supply the GREEN coating. It costs more, but it's still the best investment for severe corrosive conditions. To give special protection to the joint sealing area in Spang Extreme Line Tubing, a Teflon corrosion barrier sealing ring is used. This ring completely closes the space between the end of the male member and the inner shoulder at the depth of the female member of the joint. The National Representative in your area can furnish full details.

THE NATIONAL SUPPLY COMPANY

Subsidiary of Armco Steel Corporation

TWO GATEWAY CENTER, PITTSBURGH, PA.

DIVISION OFFICES: Calgary, Dallas, Denver, Houston, Toledo, Torrance, Tulsa

EXPORT: 600 Fifth Avenue, New York 20, N.Y., U.S.A.; City Wall House, Chiswell Street, London E.C.1

Litho in U. S. A.

Are you feeding your refinery DOLLARS . . . and getting PENNIES back in return?

Leading oil economists declare that any processing unit as much as ten years old is probably costing you money.

EXAMPLE:

Most older units utilize furnaces and heaters with only 50% thermal efficiency. Today, good design and economics dictate at least 75% efficiency.

EXAMPLE:

A ten-year-old cat cracker may require up to one-half more operating personnel than a modern unit.

EXAMPLE:

Most crude units built ten years ago needed to be shut down every six months. Modern design often permits operations of twice that length.

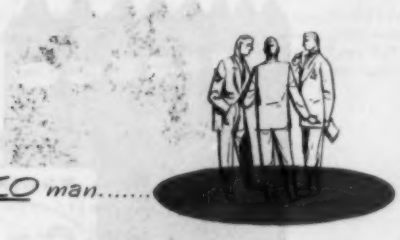
If outdated units are eating up your profits, talk with a Treco man about replacing or revamping them. And remember . . . equipment costs are lower today than you can expect for years to come. There has never been a better time to modernize.

Licensing agreements permit Treco to furnish just about any modern processes available. Although we frequently handle process design on a custom basis we own no patented processes and manufacture no refinery equipment. This leaves us free to recommend and use whatever best fits your requirements.

SEE OUR EXHIBIT

Booths 31, 32 & 87
Scientific & Technical Building
INTERNATIONAL PETROLEUM EXPOSITION
May 14-23, 1959
TULSA, OKLAHOMA

Booth 582
5th WORLD PETROLEUM CONGRESS
May 30-June 5, 1959
New York Coliseum



....talk with the TRECO man.....

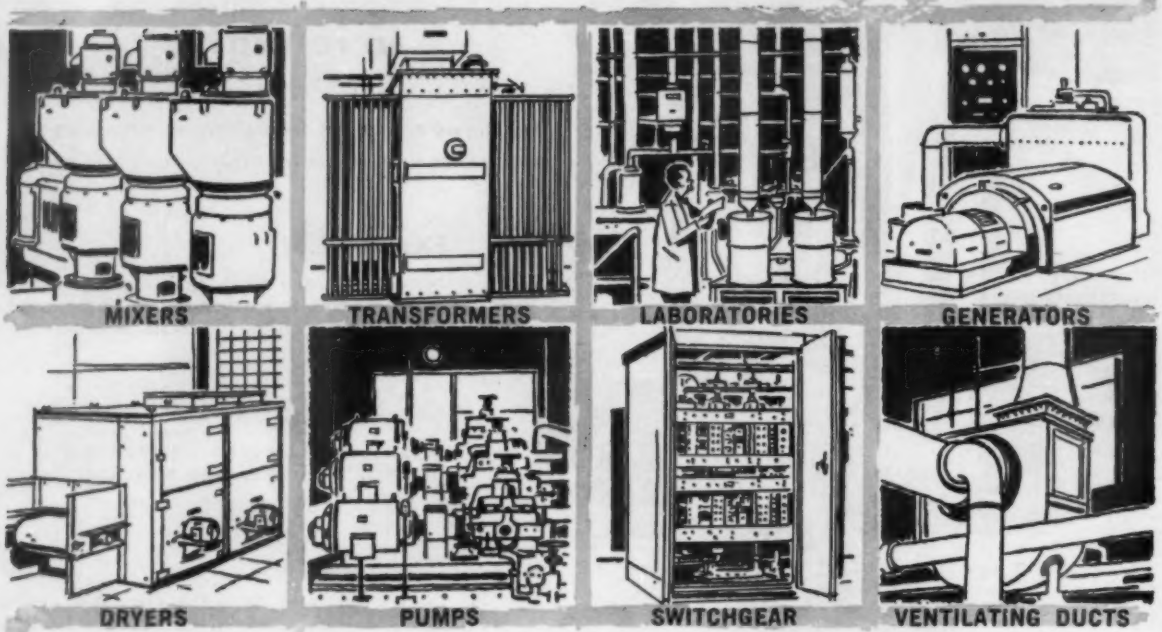
TRECO

A DIVISION of VITRO CORPORATION of AMERICA

The REFINERY ENGINEERING Company

TULSA • TORONTO BRANCH OFFICES IN OTHER STRATEGIC LOCATIONS

Which of these common fire hazards threaten you?

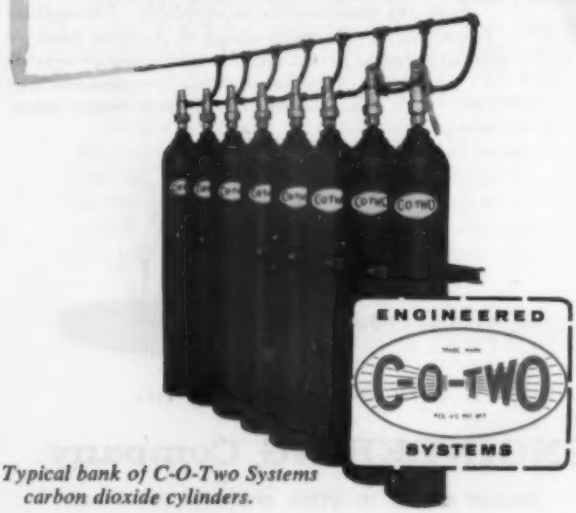


If your plant has one or more of these common fire hazards, ordinary fire protection may not prove adequate! You also need special fixed-type protection that constantly guards specific highly hazardous areas!

C-O-Two Fire Extinguishing Systems are specially designed for closed or partially-closed spaces in which highly flammable liquids or solids are manufactured, handled or stored . . . or where there is fixed or rotating electrical equipment. The C-O-Two line includes dependable, high-quality carbon dioxide, dry chemical or foam systems to extinguish fire, plus detecting systems to detect and locate fire automatically.

Your experienced C-O-Two representative is well qualified to carefully analyze all special hazards. Because he offers the industry's largest line of fire protection products and services, he can make equipment recommendations without prejudice. Each C-O-Two System is carefully engineered and manufactured . . . and C-O-Two will also expertly install the system, if desired.

Why not review your common fire hazards now? If protection is either lacking or inadequate, you can confer at no obligation with your nearby C-O-Two Industrial Fire Protection Engineer! Call him today at these offices:

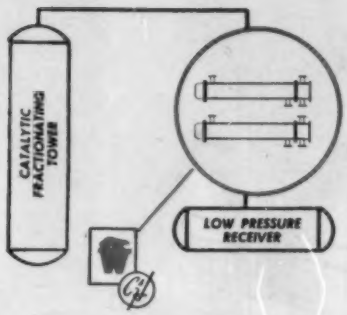


Typical bank of C-O-Two Systems carbon dioxide cylinders.

products of
THE FYR-FYTER COMPANY

ATLANTIC COAST REGIONAL OFFICE
P.O. Box 750, Newark 1, New Jersey
CENTRAL STATES REGIONAL OFFICE
221 Crane St., Dayton 2, Ohio
PACIFIC COAST REGIONAL OFFICE
132-140 Hawthorne St., San Francisco 7, California

BRANCHES: Atlanta, Baltimore, Boston, Chicago, Dallas, Dayton, Detroit, Los Angeles, New York, Newark, Philadelphia, Pittsburgh, Portland, Rochester, San Francisco, Seattle, Toronto (Ontario). Representatives and Distributors in all principal cities.



NEW "CAT" FRACTIONATOR OVERHEAD CONDENSERS TUBED WITH WOLVERINE TRUFIN® TYPE S/T CONDENSER TUBE

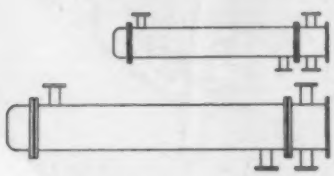
Because of Wolverine Trufin Type S/T condenser tube, new standards of efficiency and economy are daily being established in the field of heat transfer. Diagramed above is another Trufin installation—this time the condensing, for a large Midwest refinery, of hydrocarbon overhead vapors from a catalytic cracking unit fractionating tower.

Illustrated here are four solid reasons why this company specified Trufin Type S/T for the job.

Wolverine Trufin Type S/T will work exactly the same for you as it does for this company. Put it to the test—specify it next time you retube existing equipment or are contemplating the design of new units. Write today for your copy of the Process Flowsheet booklet—it's filled with helpful design information.

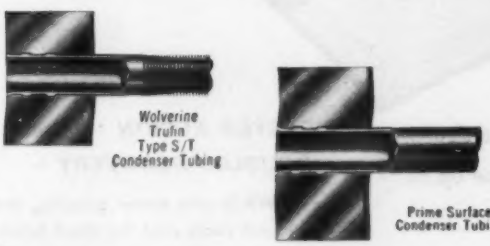
1

INCREASED EFFICIENCY—Trufin Type S/T is an extended surface tube with its fins an integral part of the tube wall. Because of this, Type S/T has more than two times the heat transfer surface of prime surface tube—extracts more BTU's per foot of tube. Shown here are comparable lengths of tube for equivalent heat transfer surfaces.



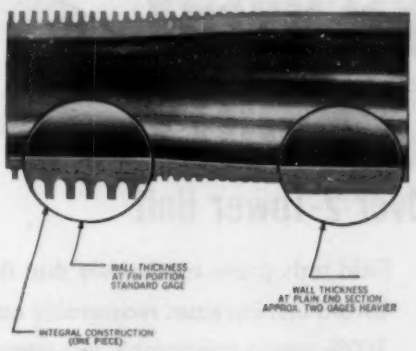
2

LOWER COST—Type S/T's additional outside surface area permits the use of less tube for a given heat duty. You get smaller shells, baffles, reduce fabricating costs with lower maintenance because there are less tubes to clean.



3

EASY INSTALLATION—Trufin Type S/T rolls into headers as easily as plain tube—uses the same fabrication methods. Standard rolling-in tools are used. There is no deviation from existing fabrication procedures.


WALL THICKNESS AT FIN PORTION STANDARD GAGE
WALL THICKNESS AT PLAIN END SECTION APPROX. TWO GAGES HEAVIER
INTEGRAL CONSTRUCTION (ONE PIECE)

4

ENGINEERED FOR THE JOB—Trufin Type S/T is specifically designed for shell and tube applications. The cutaway photograph illustrates its unique, one-piece construction. Because of this, Type S/T gives constant efficiency—its fins are unaffected by thermal shock, vibration or varying pressures.

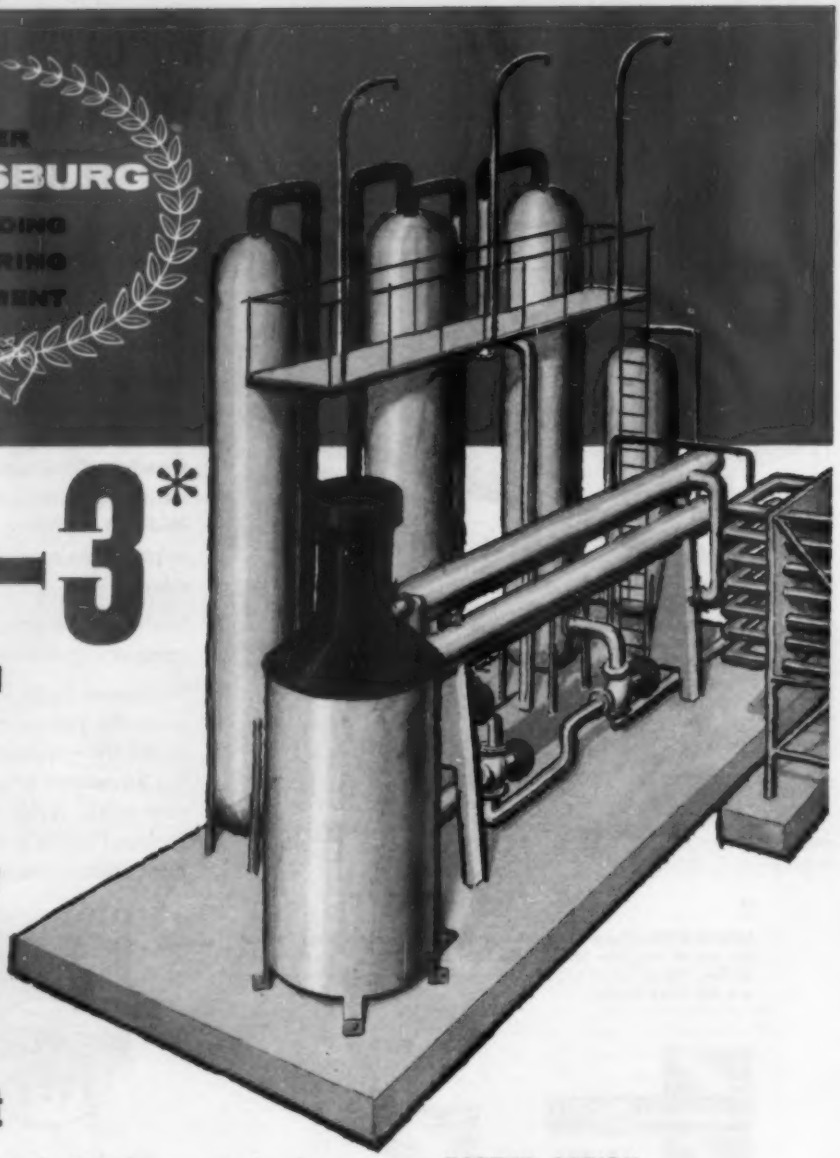
CALUMET & HECLA, INC.
CALUMET DIVISION
URANIUM DIVISION
GOODMAN LUMBER DIVISION
WOLVERINE TUBE DIVISION
In Canada:
CALUMET & HECLA OF CANADA LIMITED
WOLVERINE TUBE DIVISION
CANADA VULCANIZER & EQUIPMENT CO. LTD.
UNIFIN TUBE DIVISION

WOLVERINE TUBE
DIVISION OF
CALUMET & HECLA, INC.
17238 Southfield Road
Allen Park, Michigan
Manufacturers of Quality-Controlled Tubing and Extruded Aluminum Shapes

Wolverine Trufin is available in Canada through the Unifin Tube Company, London, Ontario

PLANTS IN DETROIT, MICHIGAN, AND DECATUR, ALABAMA. SALES OFFICES IN PRINCIPAL CITIES

ANOTHER
PARKERSBURG
OUTSTANDING
ENGINEERING
ACHIEVEMENT



DAU-3*

*3-TOWER HYDROCARBON
ADSORPTION UNIT

DOUBLES RECOVERY CAPACITY

Over 2-Tower Unit

Field tests prove conclusively that the *new* Parkersburg DAU-3 unit increases recoverable natural gasoline up to 100% over a comparable two-tower unit.

THE PARKERSBURG RIG AND REEL CO.
PARKERSBURG WEST VIRGINIA
QUALITY SERVICE
MADE IN U.S.A.

See Your
PARKERSBURG
Man Today!

FASTER ACTION DOUBLES RECOVERY

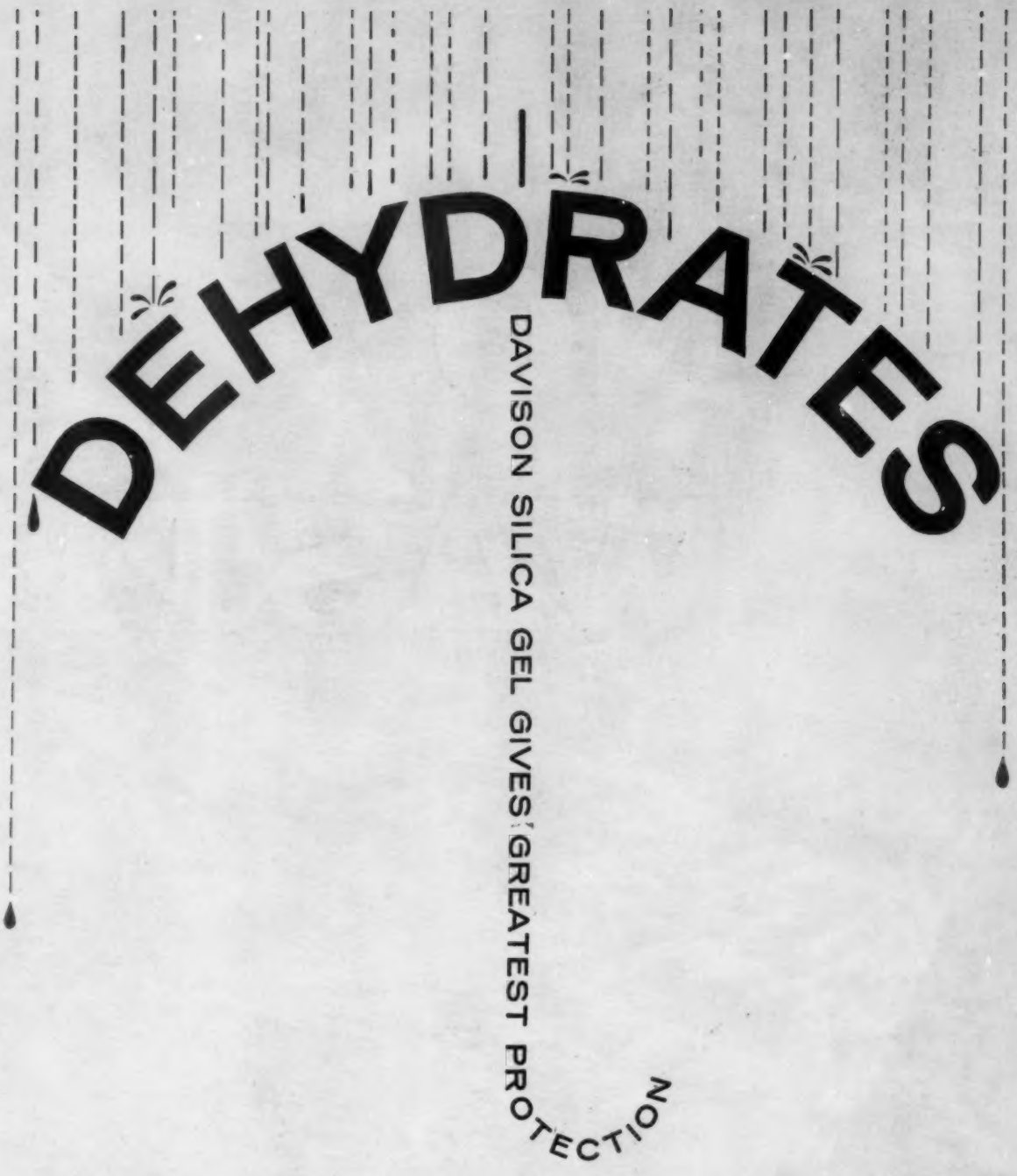
While one tower adsorbs, the second cools and the third heats. This triple action eliminates the waiting periods common with the double-tower unit.

SMALLER HEATER REQUIRES LESS FUEL

The smaller heater used on the *new* DAU-3 unit burns continuously with no on-and-off action to delay adsorption or waste fuel.

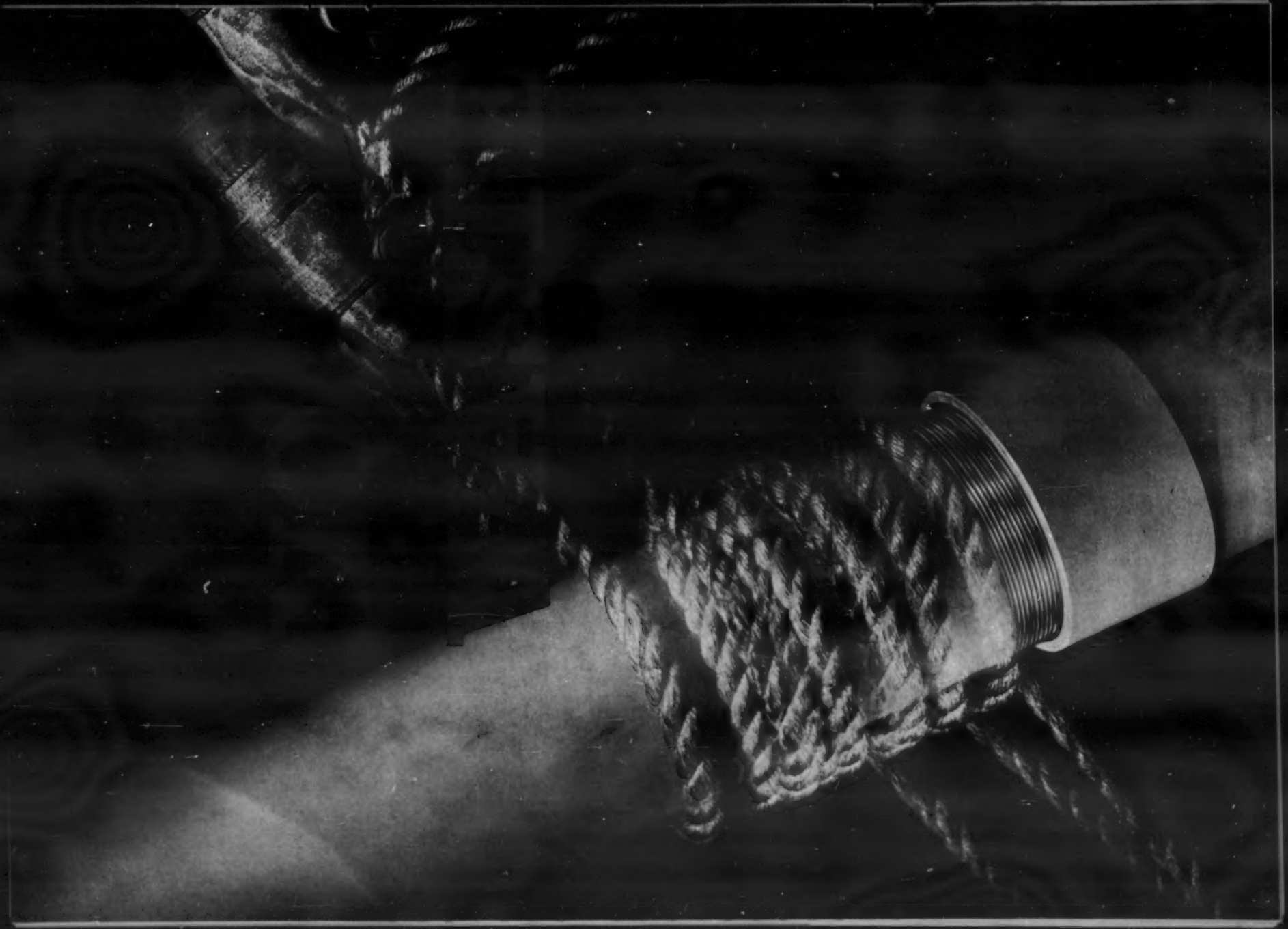
THE
PARKERSBURG
RIG AND REEL COMPANY
Division of Parkersburg-Aetna Corp.
PESA

HOUSTON • TULSA • PARKERSBURG



One cubic inch of Davison Silica Gel has an adsorptive surface of 90,000 square feet—an area larger than two city blocks! This capacity has made Davison Silica Gel the favored desiccant for air and gas dehydration and wherever rust, corrosion, or other moisture problems exist. For instance, Davison desiccants are used to protect tropical shipments, to clean and dehydrate air and natural gas—refrigeration systems—blast furnace gases—and in oxygen plants. Perhaps the application of a Davison desiccant to *your* moisture problems is in order. Write Department 3125 or call today for complete information.

W.R. GRACE & CO.
DAVISON CHEMICAL DIVISION
BALTIMORE 3, MARYLAND



Sweetest running pipe your money can buy! Stabs, spins-in, tongs-up fast and tight. Utmost uniformity assures positive roundness . . . clean, accurate threads. Utmost uniformity eliminates waste motion!

CASING AND TUBING

SPECIFY REPUBLIC. Fast shipment from mill or distributor stocks.

REPUBLIC STEEL

CLEVELAND 1, OHIO

World's Widest Range of Standard Steels and Steel Products

from

...Steel "Budget Buildings"

Here is dependable, low-cost housing for field crews and equipment. Rigid frame construction leaves floor area unobstructed. Rust- and fire-resistant galvanized steel roof and siding require no painting. Designed for easy erection and disassembly, Truscon "BUDGET BUILDINGS" are moved quickly ... economically ... whenever and wherever needed. Three week delivery. Send coupon for specifications.

...Plastic-Coated Steel Pipe

Republic X-TRU-COAT Plastic-Coated Steel Pipe and Tubing combines the strength of steel with the protection of polyethylene plastic. High-density plastic coating blocks electrolytic as well as chemical corrosion, offers outstanding impact strength, excellent tear- and puncture-resistance, high flexibility that permits short radius bends. Specially-developed "live" adhesive undercoat bonds plastic to steel, never becomes hard or brittle. Mail coupon for complete details.

...Semi-Rigid Plastic Pipe

Republic SRK Plastic Pipe resists highly corrosive chemicals, prevents build-up of scale, offers low friction-loss, yet costs no more than ordinary pipe. Economical brush-applied solvent and plastic fittings permit any type of joint to be made in seconds. SRK is lightweight and easy to install. Cuts with ordinary handsaw. Available in a wide range of pressure ratings and sizes from ½" through 6". Mail coupon for complete information.

REPUBLIC STEEL CORPORATION
DEPT. OG-7721
1441 REPUBLIC BLDG. • CLEVELAND 1, OHIO

Please send more information on:

- ☐ Electric Weld and Seamless Casing and Tubing
- ☐ Truscon Steel "BUDGET BUILDINGS"
- ☐ X-TRU-COAT Plastic-Coated Steel Pipe and Tubing
- ☐ Republic SRK Plastic Pipe

Name _____ Title _____

Company _____

Address _____

City _____ Zone ____ State _____

REPUBLIC STEEL

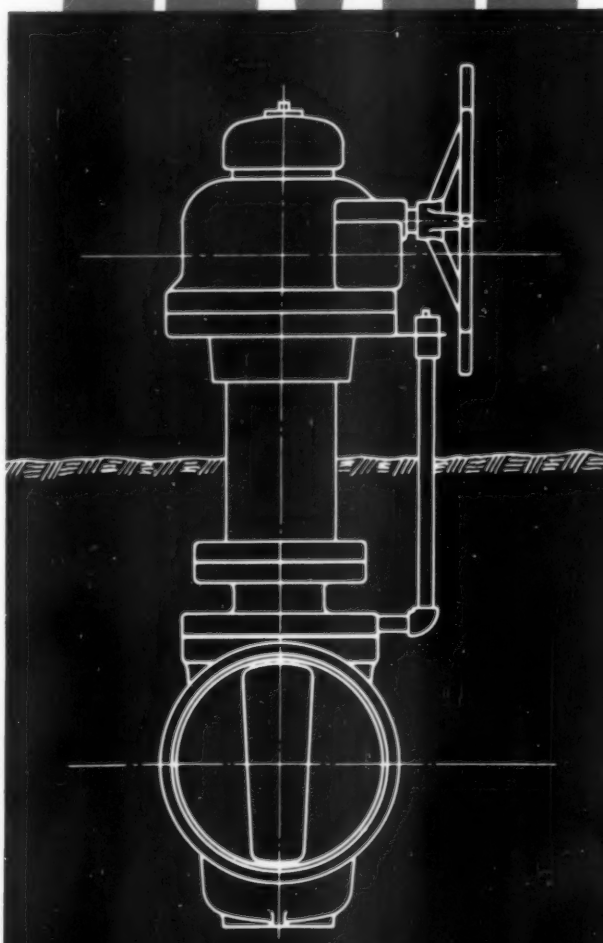
WANTED!

PLASTIC PETE
Catch him at the
International Petroleum Exposition
May 14-23 • Tulsa, Oklahoma
BOOTH #102-115

Plug, lubrication, and packing adjustments are all TOP LEVEL operations when its a Walworth LPV with extended stem.

That's right! you can junk your shovel now because of

TOP LEVEL



When you install a lubricated plug valve in buried service be sure it's a WALWORTH with extended stem.

You can install a Walworth LPV, with extended stem, below grade. And you can adjust it smoothly and easily from above ground. Lubrication and packing adjustments are TOP LEVEL operations, too. To adjust and maintain other lubricated plug valves you have to dig deep, and get underneath them. When you bury a Walworth LPV—with extended stem—you can toss your shovel away – and *cut maintenance costs.*

ADJUSTMENT

on WALWORTH lubricated plug valves

All adjustments and ALL maintenance of Walworth extended stem LPV's are done above grade. To insure a tight valve you must be certain the plug is properly seated at all times. A plug that's too loose requires excessive lubrication to prevent leakage. One that's too tight takes too much work to operate. *All* buried valves are subject to changes of temperature and line strains which affect their operation. But, Walworth Lubricated Plug Valves *can be adjusted in the field,* with small tools—*at top level.*

All Walworth Lubricated Plug Valves give you fast, easy, tight closures. A quarter turn opens or closes a Walworth Lubricated Plug Valve. It combines easy operation with tight closure because it's lubricant-sealed. And it can be serviced under pressure. In Walworth LPV's the lubricant well is at the bottom of the valve. When fully lubricated and properly adjusted, the Walworth LPV operates more easily than any other type of rotary action sealed valve.

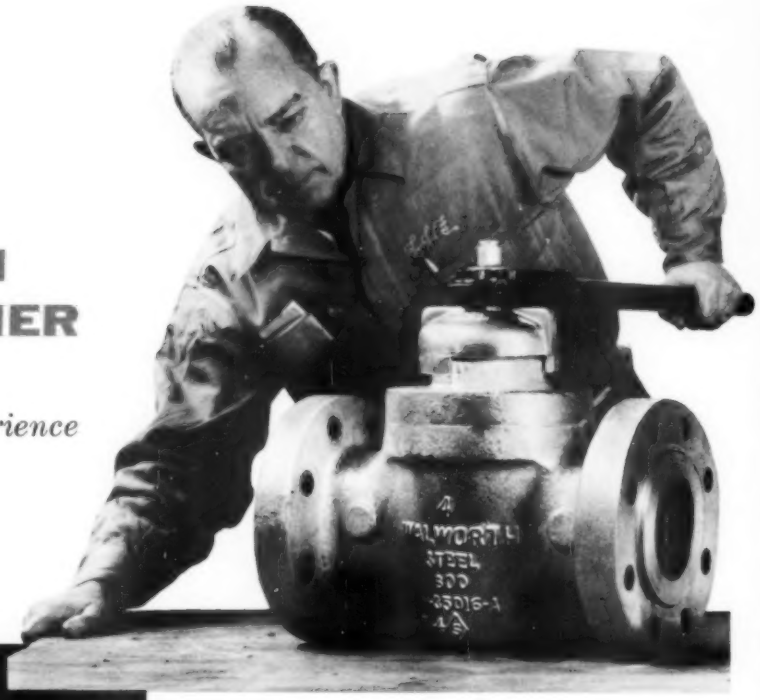
WALWORTH *750 Third Avenue, New York 17, N. Y.*

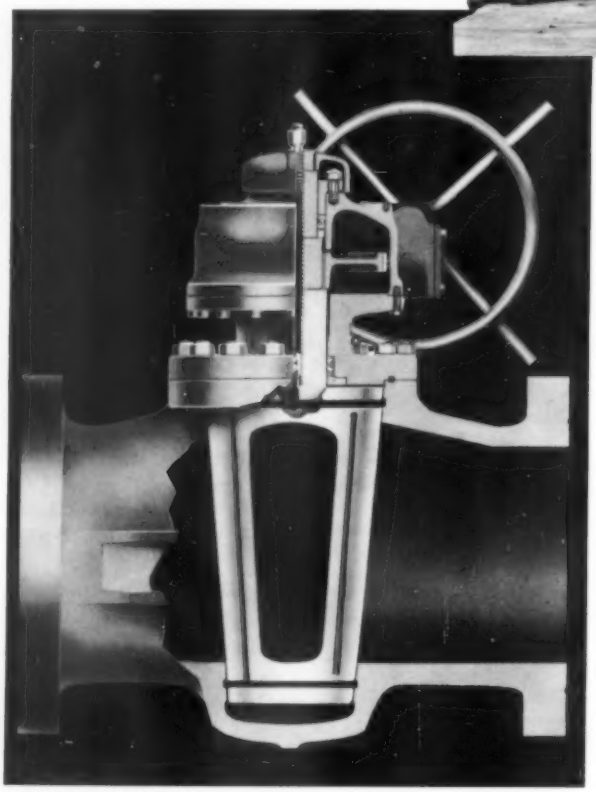
DISTRIBUTORS IN PRINCIPAL CENTERS THROUGHOUT THE WORLD

WALWORTH SUBSIDIARIES: ALLOY STEEL PRODUCTS CO. • CONOFLOW CORPORATION • GROVE VALVE AND REGULATOR CO.
M&H VALVE & FITTINGS CO. • SOUTHWEST FABRICATING & WELDING CO., INC. • WALWORTH COMPANY OF CANADA, LTD.

THE WALWORTH CUSTOMER

brings a wealth of valve operating experience to bear when he selects an LPV.





Here are 6 characteristics that make THE WALWORTH CUSTOMER choose the WALWORTH LUBRICATED PLUG VALVE

1. Provision for lubrication with Walworth High Pressure Lubricant Gun without removing lubricant fitting.
2. Groove, cut part way up side of lubricating fitting lets operator note any tendency of lubricant to extrude, *before* fitting is entirely removed.
3. *Double ball check valve* prevents line pressure from backing out through the lubrication system if Walworth lubrication fitting is removed.
4. Standard bolt threads, rather than fine threads, mean easy replacement of nuts and bolts from local stocks.
5. Two overlapping Teflon* packing rings, under pressure, form an effective seal against possible leakage without "grabbing" the plug shank. Makes plugs turn easier. Packing adjustments are made by injecting plastic packing into a sealed stuffing box.
6. Vertical and circumferential lubricant grooves completely frame the port openings, assuring a tight seal against leaks.

*DuPont registered trademark

Get the complete story on Walworth Lubricated Plug Valves – and Top Level Adjustment – from your Walworth Distributor, or contact Walworth direct.

WALWORTH *750 Third Avenue, New York 17, N. Y.*

DISTRIBUTORS IN PRINCIPAL CENTERS THROUGHOUT THE WORLD

WALWORTH SUBSIDIARIES: ALLOY STEEL PRODUCTS CO. • CONOFLOW CORPORATION • GROVE VALVE AND REGULATOR CO.
M&H VALVE & FITTINGS CO. • SOUTHWEST FABRICATING & WELDING CO., INC. • WALWORTH COMPANY OF CANADA, LTD.

HAMONDFLOTE* plastic COVER CRASHES CONSERVATION BARRIER

For over one year Sohio has tested a HAMONDFLOTE COVER installation at their Andover, Ohio bulk station. Tests involved mechanical operation, general performance and conservation characteristics.

Based on the results of tests SOHIO HAS PURCHASED SIXTEEN ADDITIONAL HAMONDFLOTE COVERS for their field conservation program.

. . . And here's what the man in charge of Sohio's station says:

"In reply to your letter of January 12, I have a HAMONDFLOTE COVER in an upright gasoline tank containing two four inch inside circumferential angles. The COVER is working excellently. It floats up and down over the angles with no ill effects on the COVER. I cannot see that there has been any wear on the COVER in a years use. It is a 25,000 gallon tank and I sell 10,000 gallons a week so it has had constant use.

The savings were apparent a week after it was installed as no fumes could be detected by nose through the top manhole cover.

It has not caused any trouble as far as filling or measuring the product or overall depth of tank (as for water or contamination of product) since it was installed. I would highly recommend the HAMONDFLOTE COVER for all products, especially gasolines."

Robert Runyan,

The Hamondflote Cover is the first practical, economical and guaranteed floating roof for small diameter tanks in marketing, bulk storage, producing and processing operations . . . constructed of rigid Polyisocyanate foam—a plastic material with exceptionally low density and high load carrying capacity, chemically inert to hydrocarbons. The Hamondflote Cover: Pays for itself in several months • Prevents product evaporation • Conserves vapor • Preserves product • Reduces corrosion of storage tanks • Low cost—no maintenance • Unsinkable • Virtually indestructible • Long life *(more than 10 years expectancy)* • Unaffected by working temperatures *(from —94° to + 300° F* • Easily installed or removed

Write or call us and we will send our nearest representative to give you full information.

*Pat. Pending, Trade Mark reg.

HAMMOND IRON WORKS

744 BROAD STREET, NEWARK 2, N. J.

HAMMOND IRON WORKS
744 Broad Street, Newark 2, New Jersey

Gentlemen:

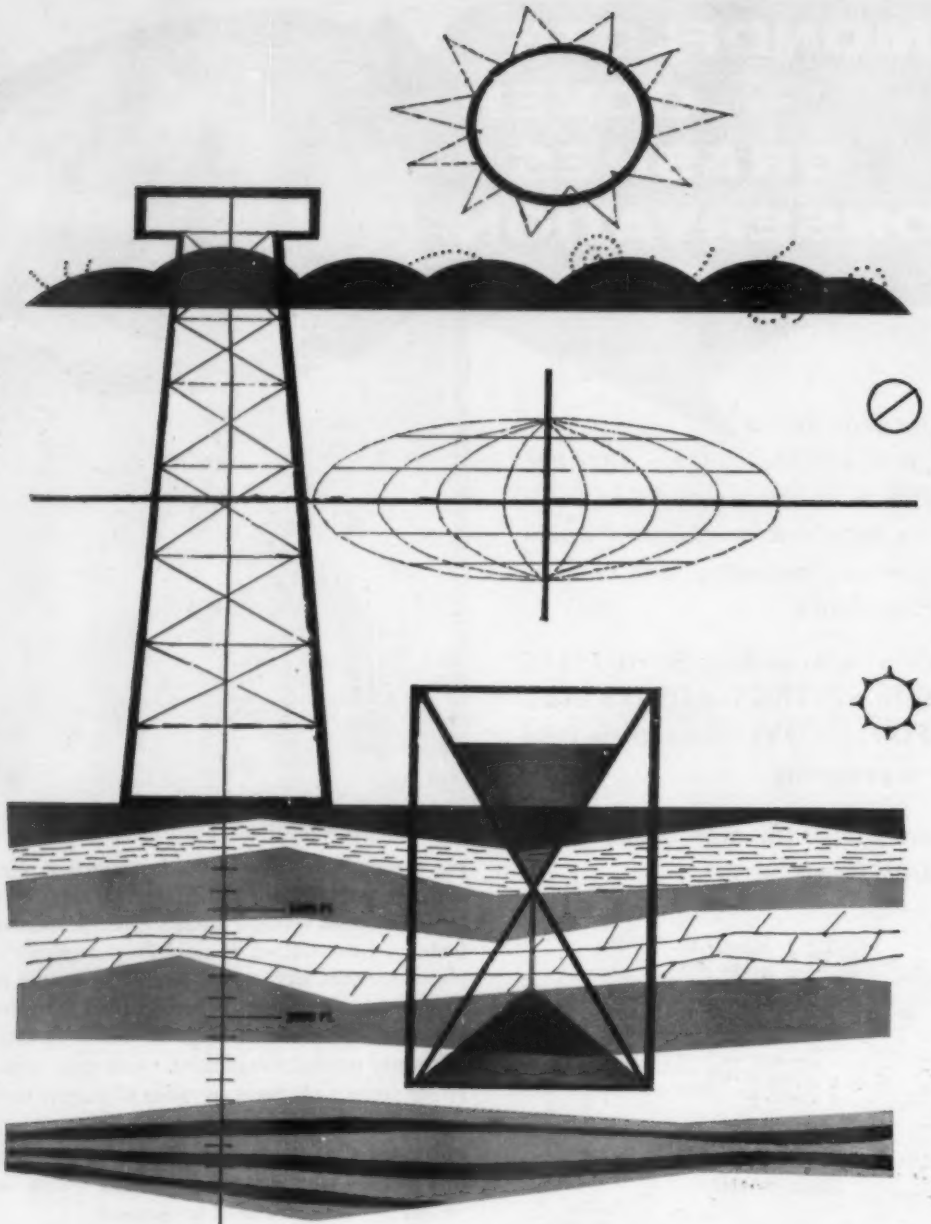
Yes, we would like to know more about your New Approach To Guaranteed Profits with Hamondflote Covers for our Storage Tanks.

☐ Please send us a copy of "Stop Evaporation" or have your representative call.

Name_____

Company_____

Address_____



NBT

THE BANK THAT WAS BORN IN THE OIL FIELD

OIL BANK OF AMERICA

Oil men like to deal with banking men who know Oil as well as they know Banking. In the Oil Department at National Bank of Tulsa, there's no separating of Oil from Banking—they're one and the same — because NBT was "born in the oil field" and continues to key its own progress to the healthy growth of the oil industry.

NATIONAL BANK OF TULSA TULSA, OKLAHOMA

Member Federal Deposit Insurance Corporation

This is Why the Nash is the Most Simple Compressor

It's the Nash!

There are no mechanical complications in a Nash Compressor. A single moving element, a round rotor, with shrouded blades, forming a series of buckets, revolves freely in an elliptical casing containing any low viscosity liquid. This liquid, carried with the rotor, follows the elliptical contour of the casing.

The moving liquid therefore recedes from the rotor buckets at the wide part of the ellipse, permitting the buckets to fill with gas from the stationary Inlet Ports. As the casing narrows, the liquid is forced back into the rotor buckets, compressing the gas, and delivering it through the fixed Outlet Ports.

Nash Compressors produce 75 lbs pressure in a single stage, with capacities to 6 million cu. ft. per day in a single structure. Since compression is secured by an entirely different principle, gas pumping problems difficult with ordinary pumps are often handled easily in a Nash.

Nash simplicity means low maintenance cost, with original pump performance constant over long periods Data on these pumps sent immediately on request

No internal wearing parts.

No valves, pistons, or vanes.

No internal lubrication.

Low maintenance cost.

Saves floor space.

Desired delivery temperature automatically maintained.

Slugs of liquid entering pump will do no harm.

75 pounds in a single stage.

NASH ENGINEERING COMPANY

313 WILSON, SO. NORWALK, CONN.

SAVE money

SAVE manpower

SAVE maintenance

SAVE with Electric Automation

Installation showing automatic control equipment . . . centrally located for convenient control of pumps supplying water for input wells, water supply well pumps and various field pumps.

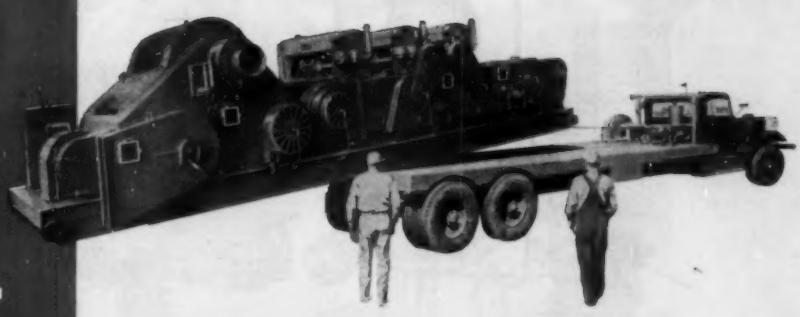
In producing fields, at pipeline stations and throughout refineries, you can save with the dependable automation of low cost Purchased Electric Power. There is nothing like Utility Electricity to give you instant, dependable power when and where you need it . . . and to give you complete automation should you require it for added savings. Let your nearest Utility Electric Power Company show you how you can save more with Purchased Electric Power . . . or write us.

Purchased Electric Power . . .
saves money, manpower, maintenance and serves you better automatically

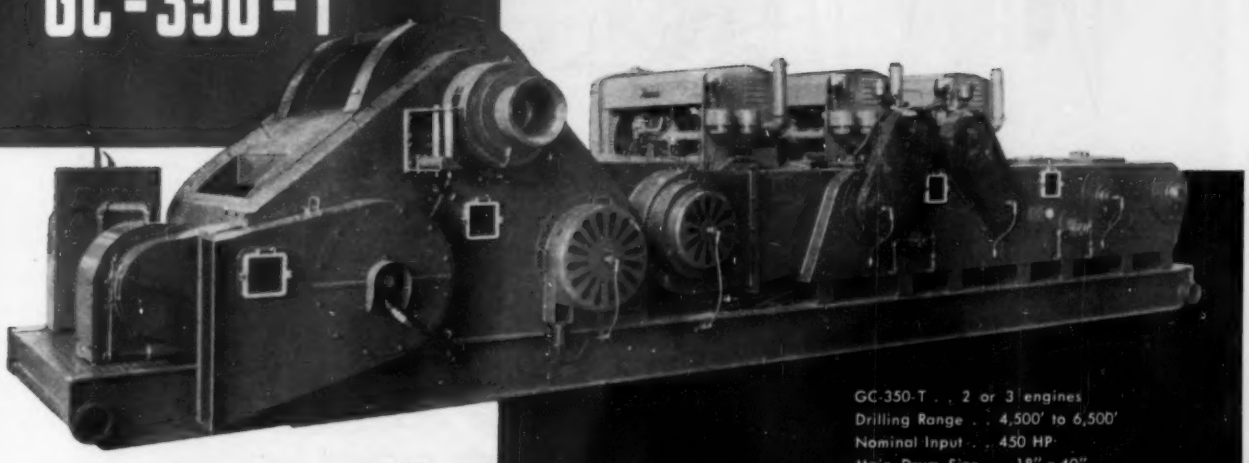
Petroleum Electric Power Association

P.O. BOX 35006, DALLAS 35, TEXAS

You Can Rig-Up Faster With a CONTINENTAL-EMSCO GC-350-T



Rig is trucked and mounted on the substructure as a single unit.



GC-350-T . . 2 or 3 engines
Drilling Range . . 4,500' to 6,500'
Nominal Input . . 450 HP
Main Drum Size . . 18" x 40"

Write for complete information, or see your Continental-Emsco representative.

Rigging-up in remote drilling sites is easier with this compact rig. Drawworks with built-in compounding and selective speed transmissions and engines are all mounted on a common skid base. Chains, air and oil lines do not have to be disconnected while making a move, rigging-up or tearing down . . fewer technicians are needed.

The GC-350-T is the sturdiest, smoothest running "350" ever built. Torque converter equipped engines are used . . compounds for two or three engines are available.

CONTINENTAL-EMSCO

Serving the Oil and Gas Industries ... Worldwide

R712R

CONTINENTAL-EMSCO COMPANY • A Division of The Youngstown Sheet and Tube Company • General Offices: Dallas, Texas
Export Division: 30 Rockefeller Plaza, New York, N. Y. • Continental-Emsco Company Limited • General Offices: Calgary, Alberta, Canada
Continental-Emsco Company C. A., Caracas, Venezuela • Plants: Houston and Garland, Texas; St. Albans, Herts., England • Representatives in All Principal Oil Fields of the World

THERE IS A DIFFERENCE

IN UNIONS -

Look at WECO!

You'll see the difference in their carefully machined seats, the accurately cut Acme threads, the precision machined pipe ends, the deep knurling on the subs that assure safe positive wrenching.

You can't see or feel the rigidly controlled heat treatment but you will know it's there when your WECO Union seats and seals perfectly after hundreds of make-up and break-outs.

Study the design, see how the ball and cone seats always *assure* a positive, full-circle, metal-to-metal seal.

Ask your supply store man about WECO Unions. They are available everywhere in a full range of sizes and pressure ratings. Now is the time for you to standardize on high quality WECO Unions.

U-6-58

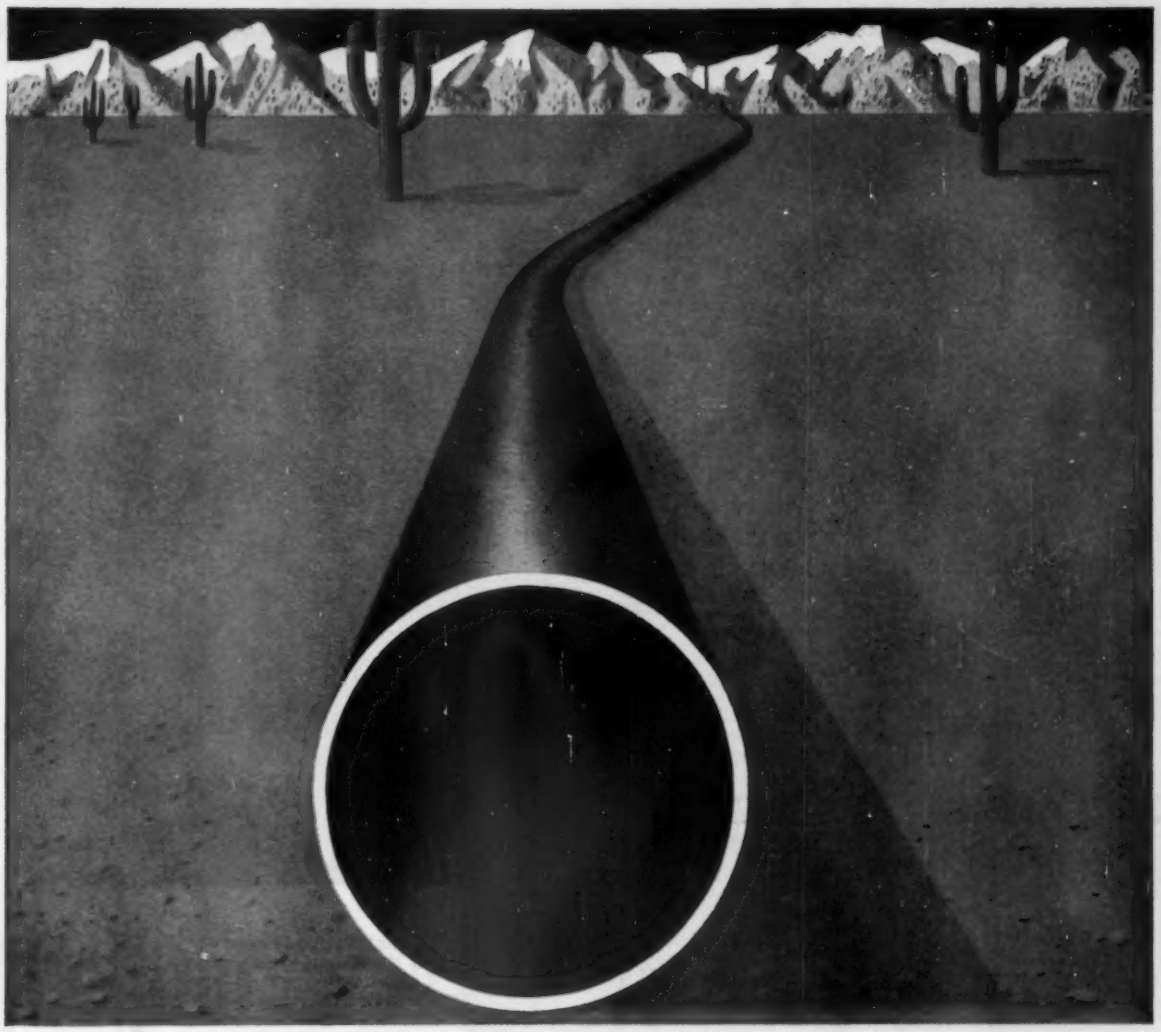
WECO

WELL EQUIPMENT MFG. CORP.

HOUSTON, TEXAS

Division of CHIKSAN COMPANY *a subsidiary of*
FOOD MACHINERY AND CHEMICAL CORPORATION

fmc



ALLIED CHEMICAL'S HOTLINE ENAMEL

defies 180°F. heat without sliding and −10°F. cold without cracking

Allied Chemical Hotline Enamel's resistance to both high and low temperatures, as well as its greater durability, compared to asphalt base and other coatings, has been proved by laboratory tests, and on-the-job performance for leading public utility companies. Allied Chemical Hotline Enamel is derived from coal-tar pitch, thus possessing inherent protective properties against the damaging effects of water, soil chemicals and electrical currents.

Improves protection under these specific conditions:

1. On pipe-type cables or "oil-o-static lines" which are subject to internal electrical heat from high-voltage surges.

2. Hot gas pipelines, on discharge side of compressor stations where line is above 120°F.

3. Warm, swampy areas or other places where excessive soil stress is encountered.

4. Areas where backfill and trenches are rough, rocky or contain objects which normally penetrate softer coatings.

5. Pipelines (such as heated fuel lines) where temperatures are constantly high most of the time, but do not exceed 180°F. or 200°F. for short term exposure.

A staff of field service experts are at your call to offer you technical assistance that can save you maintenance time and costs. **LAST WORD IN CORROSION PROTECTION.**

PLASTICS AND COAL CHEMICALS DIVISION
40 Rector Street, New York 6, N. Y.

Allied Chemical

Positive, accurate DETECTION is your best corrosion protection

COSASCO®

...your key to complete corrosion control without system shutdown!

Cosasco offers the *only* complete line of corrosion survey instruments for *all* pressure conditions—up to 10,000 psi! Now you can insert and retrieve corrosion coupons, samplers, thermocouples and probes under full line pressure, without interfering with normal operations in any way. The patented Cosasco Access Fitting principle is your key to positive, accurate corrosion survey programs in transmission, storage, injection, recovery and processing equipment—at all times and under all conditions!

Free Corrosion Survey Service. If you have a corrosion survey problem, Cosasco can help you solve it. Send details and blueprints and the Cosasco solution will be worked out promptly—at no cost to you.

Cosasco offers complete line of "use-engineered" corrosion survey instruments. In representative group shown above are (l to r): Thermocouple Survey; Product Sampler; Corrosometer* Probe; Hydrogen Probe (Chiksan swivel type); Hydrogen Probe (Standard type); Disc-type Coupon Holder (bottom of line application); Coupon Holder (Standard inside register type); Coupon Holder (Extension tongue type); Pre-Stressed Coupon Holder.

*T.M. REGISTERED

High-Pressure Retriever Assembly—Corrosion survey instruments are easily removed and replaced under full line pressure through service valve and Cosasco High-Pressure Retriever, as shown here. Access Fitting body has union type assembly with Acme outlet for fast valve installation, long thread life.

COSASCO®

DIVISION

PERFECT CIRCLE CORPORATION

11655 McBEAN DR., EL MONTE, CALIFORNIA

EXPORT OFFICE: 3631 ATLANTIC AVENUE, LONG BEACH, CALIFORNIA

BUY BETTER...FROM BAROID

The stores where you buy profit

Look for the bright yellow and red Baroid store near you—wherever you drill Baroid men know YOUR needs. They are setting new records for prompt, complete delivery of mud products that help you drill faster and with more assurance of profit to you.

BAROID

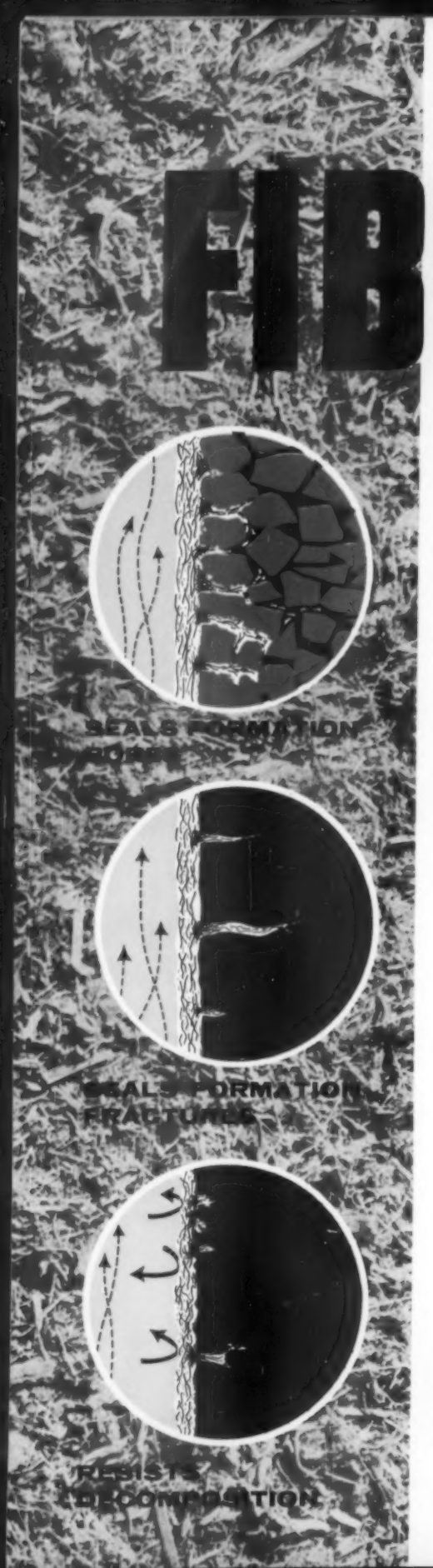
BAROID DIVISION • NATIONAL LEAD COMPANY

MAIN OFFICE: P. O. BOX 1675, HOUSTON 1, TEXAS

5907

Seeing is believing

FIBERTEX*



strong fibers *permit mud circulation without loss.*

FIBERTEX . . . bridges formation pores and blocks fractures to prevent or stop mud loss.

FIBERTEX . . . graded fiber sizes give quicker, more effective sealing.

FIBERTEX . . . mixes easily, works fast, resists decomposition. A little goes a long way.

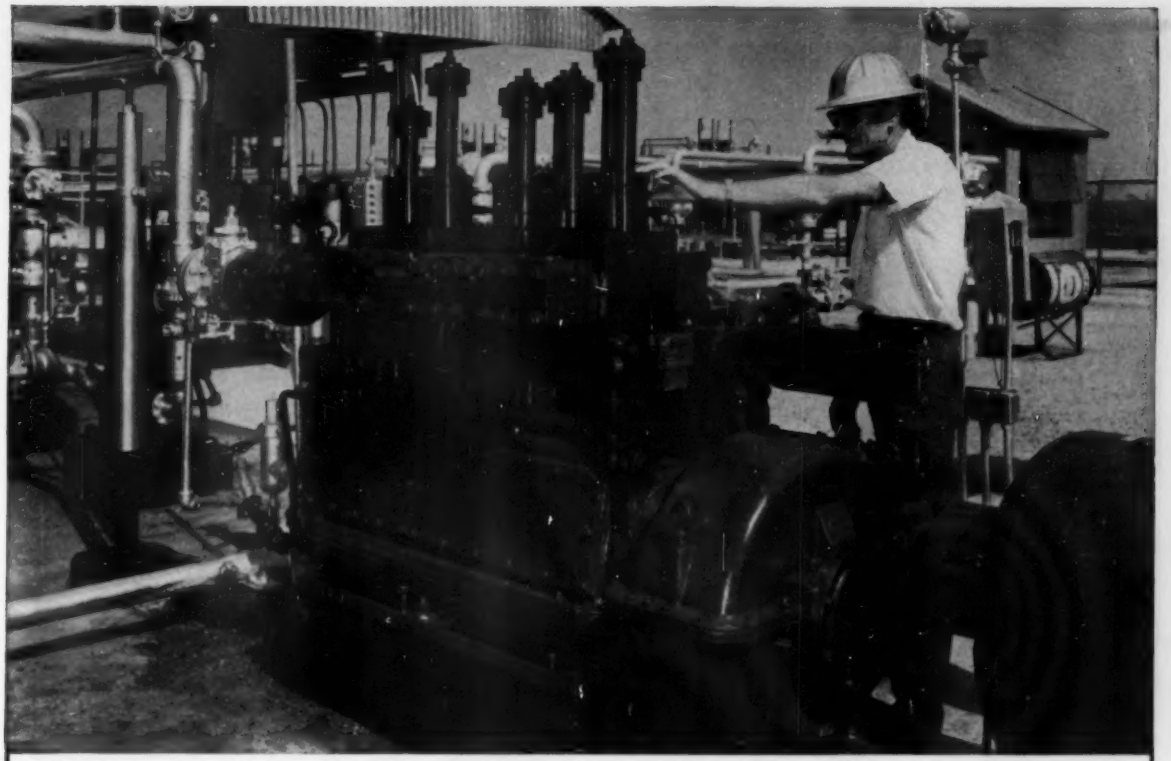
BAROID

BAROID DIVISION
NATIONAL LEAD CO.

Main Office: P. O. Box 1675, Houston 1, Texas

*Registered Trademark, Baroid Division National Lead Co.

5906



FIELD REPORT

SERVICE: LP-Gas Injection
Burnell—North Pettus Cycling Plant

PUMP: 1½" x 5" Aldrich Quintuplex

OPERATION STARTED: June, 1950

EXPERIENCE TO DATE:

Continuous service...pump delivers 52 gpm at 3000 psi. Routine maintenance annually...plungers are repacked as necessary. Customer reports: "complete satisfaction" with the performance of the Aldrich pump.

Field parts stock available in Carmi, Ill.; Calgary; Casper, Wyoming; Charleston, W. Va.; Houston; Los Angeles; Odessa and Tulsa. For further information, write the Aldrich Pump Company, 9 Gordon Street, Allentown, Pa.

the toughest pumping problems go to ALDRICH

Like Roaring Niagara...

there's more to Cities Service than meets the eye!

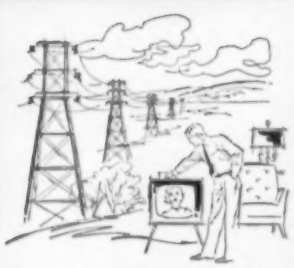
Viewed by more than 2,000,000 visitors each year, awesome Niagara Falls is more than a scenic place to honeymoon or test your skill with a camera.

Niagara's thundering waters also provide the low-cost, hydro-electric power that has given birth to one of the greatest industrial areas in the world.

In a sense, oil company operations are like that. Millions of people, for example, quickly recognize the Cities Service emblem and the 19,000 stations this emblem identifies. Few, however, ever see its drilling rigs at work, probing four continents for oil... and no one ever sees its thousands of miles of pipelines.

These, however, are only part of the modern facilities in which Cities Service has already invested a billion dollars. Caring for tomorrow's even greater needs will require further investment. Thus, just in the last two years, Cities Service spent over $350 million building for the future.

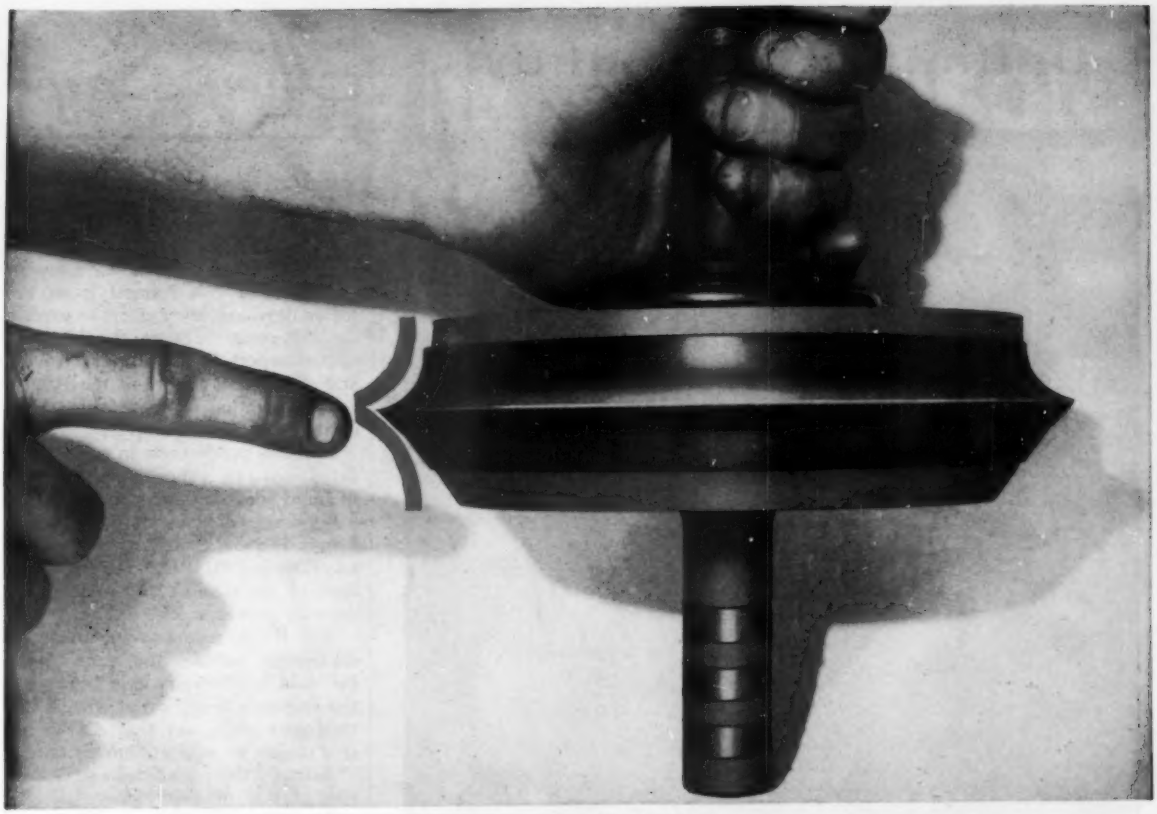
Only in this way can America be given what she must have for progress —more jobs, more and better petroleum products.



Through the low-cost, hydro-electric power created by Niagara's thundering waters, has grown one of the world's leading industrial regions. Niagara also keeps a closely guarded secret — its age. Geologists would like to know, but Lady Niagara isn't talking.

CITIES SERVICE

OIL'S FIRST CENTURY — BORN IN FREEDOM WORKING FOR PROGRESS



This AMERICAN IRON Double-Angle Insert is Outlasting ALL Others!

EVERY DRILLER who is using our new, exclusive double-angle inserts in American Iron Valve & Seat installations is reaping the benefits of these advantages:

- Lost circulation material is handled better.
- Perfect clearwater prime.
- More cushion is provided for valve impact on rapid close under high pressures.
- Made of finest materials, formulated and specified by our Research Laboratory, for longer-lasting more-effective service in your pumps!

For greater economy Order AMERICAN IRON Slush Pump Valves & Seats with the exclusive inserts!

Available through your Supply Store

Another AMF Product PETROLEUM EQUIPMENT

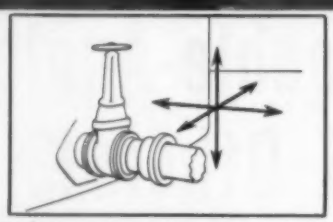
AMERICAN IRON & MACHINE WORKS COMPANY, INC.
518 North Indiana Avenue • Oklahoma City, Oklahoma
Subsidiary of AMERICAN MACHINE & FOUNDRY COMPANY

36 Years' Experience in Designing and Manufacturing Oil Field Equipment.

AMERICAN IRON & MACHINE WORKS CO. INC. • OKLAHOMA CITY •

Unlimited Flexibility!
—PROVEN IN SERVICE

Left—Cross-section shows construction of Barco Flexible Ball Joint.



Allows 6-Way Movement!

Freedom of movement in any direction is readily possible with these *ball joint connections* of 12" pipe (right) and 8" pipe (left) to 80,203 bbl. tank shown in above photo. (Photo: SHELL OIL COMPANY, Dominguez Refinery, Wilmington, Calif.)

Barco Ball Joints—*Fire Safe!*

provide complete protection against FIRE, PIPE EXPANSION, TANK SETTLING

Major oil companies throughout the country now approve the use of Barco's new large size Flexible Ball Joints on tank connections for the following reasons:

1. Fire-safe. The joints have passed rigid fire and water spray tests.
2. Superior for handling pipe expansion—no combustible packing, no thin wall sections, no "end thrust" from pressure, no heavy pipe anchoring required.
3. Complete protection—relieve strain and twisting forces on valve flanges or tank wall.
4. Compact! Ideal for use inside narrow space between fire wall and tank. Easy to design piping for any amount of flexibility desired.
5. Also useful for insulating piping against electrolysis.
6. Long service life without maintenance. No lubrication. Sizes to 16"; flanged or welding ends.

For engineering recommendations, see your nearest Barco representative or write. ASK FOR CATALOG 215B and BULLETIN 31-A.

PRODUCTS BACKED BY EXPERIENCE
BARCO
FOUNDED 1916

BARCO MANUFACTURING CO.
539F Hough Street • Barrington, Illinois

The Only Truly Complete Line of Flexible Ball, Swivel, Swing and Revolving Joints
In Canada: The Holden Co., Ltd., Montreal

They Say—

Wildcat debate continues

Dear Sir:

Mr. Ralph's Journally Speaking on page 45 of the March 23 issue of The Oil and Gas Journal is an unfortunately confusing effort to explain the difference between the Journal's annual report on exploratory drilling and the annual report of the American Association of Petroleum Geologists on the same subject.

It shows carelessness in referring to definitions, an almost complete lack of knowledge or understanding of the history and policies of the AAPG's Committee on Statistics of Exploratory Drilling (CSED), and an ignorance of the diversity of some of industry's procedures.

Mr. Ralph seems to be unable to distinguish between the terms "wildcat" and "exploratory hole." He states the Journal's definition of wildcat and then goes on to say that AAPG has five classes of wildcat. This is not so.

Actually, there are listed and defined five classes of exploratory hole, of which two are wildcats, namely, the new-pool wildcats and the new-field wildcats. Outposts, deeper-pool tests, and shallower-pool tests are exploratory, but they are not wildcats. Exploratory hole is not synonymous with wildcat, nor is wildcat synonymous with exploratory hole.

The Journal's extracts from Mr. Blanpied's article (OGJ, Mar. 9, 1959, p. 88) should have referred to exploratory drilling as Mr. Blanpied had it in his article; but the Journal, knowingly or in ignorance, changed Mr. Blanpied's correct use of this term to wildcat drilling. As Mr. Blanpied clearly explained, in 1958 the percentage of success of all exploratory holes was 19.46, whereas the percentage success of the new-field wildcats was 11.32. There is a difference which is highly significant.

The classification and terminology of the AAPG Committee on Statistics of Exploratory Drilling were the result of a long and careful study by a committee of experienced geologists under the Petroleum Administration for War and they were later adopted, with unanimous consent, by the AAPG committee.

This committee consists of a country-wide body of technically trained men who have been taught the meaning and scope of the terms used in this classification. Every year all exploratory wells drilled are care-

CHECK WITH IVERSON
whatever your requirements

OVER 55 YEARS SERVING THE OIL INDUSTRY

OVER 33 YEARS AS A SUPPLY COMPANY

Iverson Supply Stores and Offices are strategically located, ready to serve your oil field needs quickly and efficiently, day or night.

For over 33 years, the Iverson Supply Company has been known for its excellent reputation, and its Guarantee of Satisfaction backing every piece of equipment handled through its supply stores.

IVERSON SUPPLY STORES

OKLAHOMA — Oklahoma City, Okmulgee, Tulsa.
NEW MEXICO — Artesia, Farmington.
TEXAS — Kermit, Odessa, Snyder.
COLORADO — Cortez.

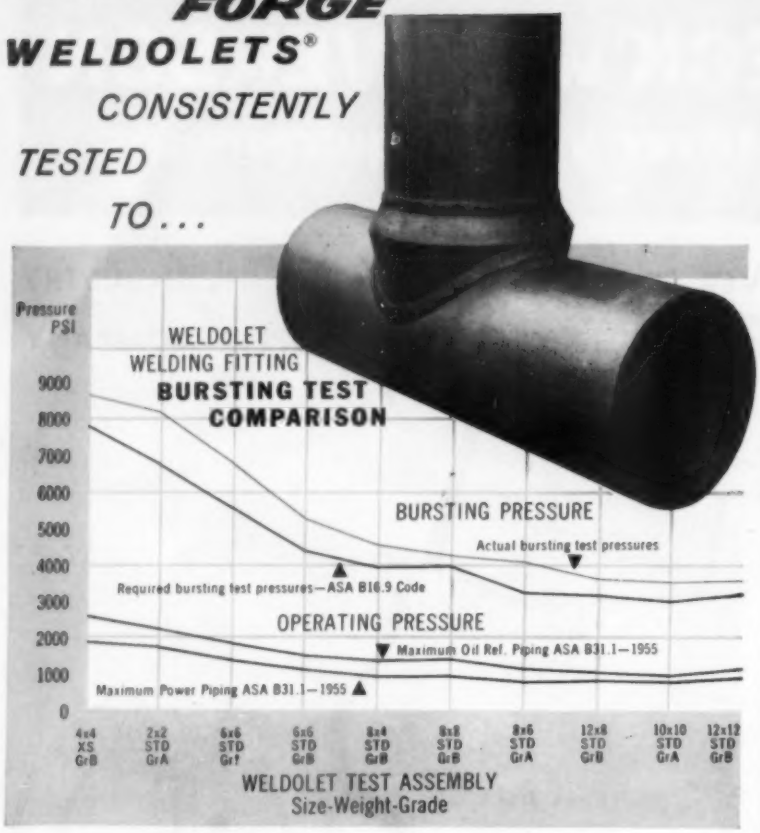
OFFICES:
FT. WORTH, DALLAS & MIDLAND, TEXAS

IVERSON SUPPLY COMPANY

DRILLING-PRODUCTION AND REFINERY EQUIPMENT
GENERAL OFFICES
P. O. BOX 1439 TULSA 1, OKLA.

OFFICES:
DENVER, COLORADO
TULSA, OKLAHOMA

BONNEY FORGE
WELDOLETS®
CONSISTENTLY
TESTED
TO...



...OVER
4½ TIMES MAX. OPERATING PRESSURE

"Shape of Reinforcement"—has been pioneered by Bonney for the past 20 years. The fact that shape is as important and even more important than area replacement for branch reinforcement is now gaining wide industry recognition. Even though Weldolets *do* have sufficient area replacement, the factor setting them apart from conventional lap type reinforcement is their SHAPE... Reinforcement close to the juncture—completely bonded homogeneous reinforcement avoiding cracks, fillet welds, and re-entrant corners—reinforcement tapering at the sides to prevent abrupt change in thickness where fitting joins header pipe.

Recent design improvements in the Weldolet line, based on extensive stress analysis tests, provide all these desirable "shape" factors. Specify and use Weldolets for all your full size and reducing branch connections. They are available in carbon steel and all alloys for any piping service.

BONNEY
WELDOLETS®
THREDOLETS®
SOCKOLETS®
ELBOLETS®
BRAZOLETS®
SWEEPOLETS®
CARBON STEEL
STAINLESS
ALLOY
for all services

BONNEY FORGE and TOOL WORKS
ALLENTOWN, PENNSYLVANIA

fully studied and classified by these men. Every effort is made to see that all the statistics presented by this committee are analogous.

Contrast this with Mr. Ralph's statement that "We (the Journal) get our weekly completion figures from the scout checks all over the country. (As a matter of convenience," he continues parenthetically, "we get them via a few major companies who collect scout checks in the areas where they operate. Each area has its own official or unofficial definition of a wildcat. . . ."

Exactly, Mr. Ralph. There is no universal definition of wildcat among companies or scouts. For example, one major company, for its own purposes defined the first well to be drilled on any of its leases, even in the midst of a producing field, as a wildcat. Regulatory bodies in the different states also have their own methods of classification.

Therefore, acceptance of such data from different industry sources does not in any way assure that they are analogous. On the other hand, the scout-check information, all of which comes to the members of the committee on statistics of exploratory drilling, is studied and classified by these members according to terminology rules laid down for this committee. Any company or regulatory body departures from this committee's standard classification are corrected to agree with the committee's definitions.

I would suggest to Mr. Ralph that he carefully and thoughtfully read the last 15 annual reports of the CSED as published in the Association's Bulletin each June, and that he then thoroughly investigate the exact sources, scope, and methods of exchange, of the statistical information which he, as representative of the Journal, is defending.

Frederic H. Lahee
Consulting Geologist
Past chairman, CSED
Dallas

Editor's note: We're glad to have this wrist-slapping from the industry's most outstanding authority on exploratory drilling statistics. As our good friend, he is entitled to hand us brickbats as well as bouquets, and we welcome them both.

We have the greatest respect for the CSED statistics. At the same time, we cannot agree that they are accepted throughout the industry. Many geologists and companies feel that the classification is needlessly cumbersome and complicated.

As Dr. Lahee points out, there is no universal definition of "wildcat", and many companies (including some with members sitting on the Blanpied committee) do not follow the classifica-

DIRECTIONAL DRILLING • FISH TTING • ELECTRICAL WELL SERVICES • OILFIELD SUPPLIES • EXPORT TOOLS & SERVICE

THE HOMCO WASHOVER BACK-OFF CONNECTOR RECOVERS THE PIPE

HOMCO
Fishing, Cutting and Electrical Well Service

Affords less rig time

Aids in the recovery of more pipe

Safe
Economical
Dependable

The HOMCO Washover Back-Off Connector is designed to safely increase the rate of recovery of stuck drill pipe or tubing in washover operations.

The basic function of the connector is to enable the operator to washover and back-off with the string shot, recovering the "fish" with one round trip of the drilling string, thus saving rig time.

On an actual fishing job, through the use of the HOMCO Washover Back-Off Connector and HOMCO String Shot, only seventeen trips were necessary to recover 9,188 feet of pipe. A total of 207 hours of rig time was used. Without the use of the HOMCO Washover Back-Off Connector and String Shot a total of 34 trips would have been required and 412 hours of rig time would have been used to accomplish the same job.

research
engineering
development
manufacturing

HOMCO
HOUSTON OIL FIELD MATERIAL COMPANY, Inc.

WORLD'S LARGEST INDEPENDENT OILFIELD SUPPLY AND SERVICE ORGANIZATION

EXPORT OFFICES
HOUSTON, TEXAS (HEADQUARTERS)
NEW YORK, N.Y.
MEXICO CITY, MEXICO
LONG BEACH, CALIFORNIA
MARACAIBO, VENEZUELA
PARIS, FRANCE

WRITE FOR TECHNICAL BULLETIN NO. 27-1-1

Sample the luxury of DELTA's

Royal Service

DC-7 FLIGHTS

between

CARACAS · MONTEGO BAY · HAVANA
NEW ORLEANS and CHICAGO

Here is the ultimate in luxury. Three courteous stewardesses assure unhurried, pleasant dining . . . fine Champagne is served with meals . . . plus Beverage Service . . . a special airport passenger agent . . . fast baggage handling . . . music by Muzak and many other luxury features, at *no extra fare!* Ask for Royal Service Flights to other major cities, too.

NOW...Non-stop EL PETROLERO DC-7's

every Saturday between New Orleans and Caracas;
one-stop between Houston and Caracas.
Connections at New Orleans to and from all points in mid-America.

Call Delta or see your Travel Agent

GENERAL OFFICES: ATLANTA AIRPORT, ATLANTA, GEORGIA

Delta AIR LINES

tion at all. But for purposes of reference and standardization, CSED figures are most valuable.

Significantly, taking the committee's two strictly wildcat classifications new-field wildcats and new-pool wildcats), and comparing their 1958 success ratios with that of Journal wildcats, we come up with the following:

Journal: 14.1%
CSED: 14.4%

We think that's pretty close agreement for "analogous" vs. scout check figures, and that it provides good reason for defending Journal statistical information).

Money erosion

"The steel industry must be heavily invested in expensive long-term facilities. Because of this, the real capital of steel companies is eroded away by the present income tax. This is because it takes many more of today's dollars to replace equipment as it wears out than it took originally to purchase the equipment many years ago.

"But depreciation allowed in computing taxable income is limited to the smaller number of dollars originally expanded. The difference between such depreciation and the larger amount needed to recover the purchasing power expended—and so to keep the facilities intact—is arbitrarily called income and taxed as such.

"Thus, the corporate income tax not only hampers the formation of new capital but also erodes away existing capital, and does it in highly inequitable fashion because of the varying importance of depreciation to the businesses taxed."

Arthur V. Wiebel, president, Tennessee Coal and Iron division of United States Steel Corp., in a speech to the Tuscaloosa, Ala., Civitan Club.

Letters to They Say should be addressed to The Editor, The Oil and Gas Journal, Box 1260, Tulsa, Okla.

CALENDAR

MAY

25-27 Chemical Institute of Canada, forty-second annual conference, Halifax, N. S.

25-27 American Society for Quality Control, annual convention and exposition, Public Hall and Hotel Sheraton Cleveland, Cleveland.

25-28 American Society of Mechanical Engineers, machine-design division, design-engineering conference, and Clapp & Poliak, Inc., design-engineering show, Convention Hall, Philadelphia.

27-29 American Petroleum Institute, Division of Marketing, midyear meeting, Savery Hotel, Des Moines.

27-29 Southern Gas Association, fourteenth annual short course in gas tech-

MUD MONARCH

SILVER TOP

ONE OF THESE

SUPER-SERVICE

valves and seats will cut your costs, too.

Each type of valve and seat is designed to be the best for its service. And even more, each Mission Valve and Seat is *built* to be the best. Advanced metallurgy, precision machine tools, and rigid quality control combine to cut replacement costs, to increase the efficiency of pump operation.

Mission MUD MONARCH® Valves and Seats *for extremely high and medium pump pressures.* Unique design with exclusive seal ring results in exceptional performance as this ring seals effectively when body and seats are severely worn. Compound 308® and Compound 711 inserts are available.

Mission SUPER-SERVICE® Valves and Seats *for medium pump pressures.* Four crossarms provide extra strength and large striking surface, assuring long valve seat life without restricting flow area.

Mission SILVER TOP® Valves and Seats *for low and medium pump pressures.* Replaceable, wear-taking bushing greatly reduces valve seat replacement costs. The famous Compound 308® inserts are interchangeable with Mission SUPER-SERVICE Valves.

Mission Valves and Seats are available for all popular makes of reciprocating pumps. Buy them anywhere through your supply store.

For over thirty years—quality built in to last

MISSION MANUFACTURING CO., P. O. BOX 4209, HOUSTON, TEXAS • CABLE ADDRESS—"MISSCO"
EXPORT OFFICE: 30 ROCKEFELLER PLAZA, NEW YORK • IN THE UNITED KINGDOM: MISSION MANUFACTURING CO., LTD., 17 HANOVER SQUARE, LONDON W. 1 ENGLAND • CABLE ADDRESS—"MISSOMAN"
PISTONS • PISTON RODS • SLIPS • GLAND PACKINGS • LINERS • LINER PACKING
PUMP VALVES AND SEATS • SWABS • VALVES • HAMMERDRILS • CENTRIFUGAL PUMPS

MISSION MANUFACTURING CO.

59-102

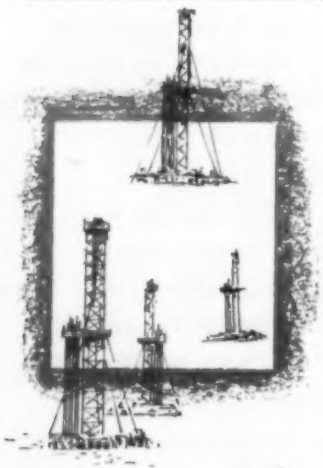
DMS®

for

STABLE DRILLING MUDS

IN LOW-SOLIDS MUDS

IN WEIGHTED MUD SYSTEMS



DMS is a water soluble nonionic surfactant for use in all drilling muds.

DMS muds are stable to high temperature, salt and anhydrite.

DMS muds have been used as drilling fluids with weights up to 22 ppg and with temperatures up to 450°F.

DMS reduces consumption of fluid loss additives and improves their efficiency in all systems, even saturated salt muds.

DMS muds minimize dispersion of drilled solids and reduce maintenance and watering back.

DMS, packed in distinctive red checked drums, is available in all drilling areas.

Consult your local Baroid or Magcobar Dealer for product know-how and Service.

Visit Our Booth No. 622, 5th World Petroleum Congress Exposition, at the Coliseum, New York—June 1 to June 5

From Research to Reality

ANTARA gaf

ANTARA CHEMICALS

A SALES DIVISION OF

GENERAL ANILINE & FILM CORPORATION

435 HUDSON STREET • NEW YORK 14, NEW YORK

nology, Texas College of Arts & Industries, Kingsville, Tex.

27-30 American Petroleum Institute, Division of Refining, midyear meeting, Statler Hotel, New York.

30-June 5 Fifth World Petroleum Congress, Coliseum, New York.

JUNE

2-4 Appalachian Underground Corrosion Short Course, University of West Virginia, School of Mines, Morgantown, W. Va.

4-5 Kentucky Oil and Gas Association, annual meeting, Phoenix Hotel, Lexington.

8-9 University of Michigan, School of Public Health and College of Engineering, short course on industrial water conservation, Ann Arbor, Mich.

9-10 Petroleum Electric Power Association, annual meeting, Hotel Galvez, Galveston, Tex.

10 American Association of Oil Well Drilling Contractors, tristate chapter, annual safety clinic, Carmi, Ill.

10-12 Instrument Society of America, second international symposium on gas chromatography, East Lansing, Mich.

10-13 American Association of Petroleum Landmen, fifth annual convention, Skirvin Hotel, Oklahoma City.

11-12 Southern Research Institute, conference on "The Undiscovered Earth," Birmingham, Ala.

11-13 National Oil Scouts and Landmen's Asociation, annual meeting, San Antonio, Tex.

14-18 American Society of Mechanical Engineers, semiannual meeting, Chase and Park Plaza Hotels, St. Louis.

14-19 Society of Automotive Engineers, summer meeting, Chalfonte-Haddon Hall, Atlantic City.

15-17 Interstate Oil Compact Commission, midyear meeting, Roosevelt Hotel, New Orleans.

21-26 American Society for Testing Materials, annual meeting, Chalfonte-Haddon Hall, Atlantic City.

22-23 Michigan Gas Association, Grand Hotel, Mackinac Island, Mich

22-24 Canadian Gas Association, annual meeting, Empress Hotel, Victoria, B.C.

22-26 Gordon Research Conferences, petroleum, Colby Junior College, New London, N. H.

22-26 Air Pollution Control Association annual meeting, Statler-Hilton Hotel, Los Angeles,.

22-26 Massachusetts Institute of Technology, National Association of Corrosion Engineers, short course on fundamentals of corrosion reactions and corrosion control, MIT, Cambridge, Mass.

24-25 Western Petroleum Refiners Association, Mid-Continent regional technical-industrial relations meeting, Broadview Hotel, Wichita.

29-July 3 Gordon Research Conferences. catalysis, Colby Junior College, New London, N. H.

JULY

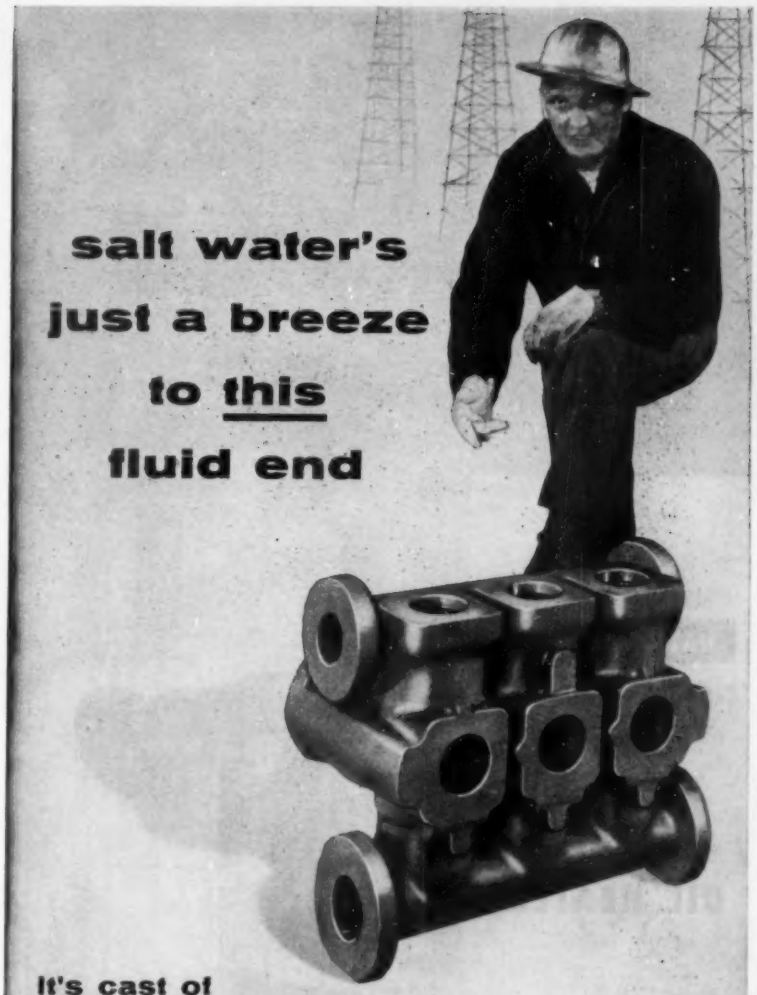
6-15 University of Michigan, short course on underground storage of natural gas, Ann Arbor, Mich.

16-17 University of Michigan, research conference on underground storage of natural gas, Ann Arbor, Mich.

27-31 University of Minnesota, continuation course, techniques of chemical infrared spectroscopy, Minneapolis.

AUGUST

3-7 University of Minnesota, continua-



It's cast of

AMPCO METAL

for tough pumping conditions

Salt water won't damage this unusual aluminum-bronze alloy. It's specially engineered to guard against failure caused by corrosion, erosion, abrasion, and cavitation-pitting. It provides exceptional strength — and does it with less weight than ordinary bronzes.

Check for this protection, when you look at specifications of duplex and triplex pumps. And insist on fluid ends of Ampco Metal for replacements on your old pumps.

Send coupon for further information on Ampco Metal in corrosive applications.

AMPCO® THE METAL WITHOUT AN EQUAL

AMPCO METAL, INC., Dept. 169E, Milwaukee 46, Wisconsin
West Coast Plant: Burbank, California

AMPCO METAL, INC.
Dept. 169E
Milwaukee 46, Wis.

Send me Bulletin PI-5a on Ampco Metal

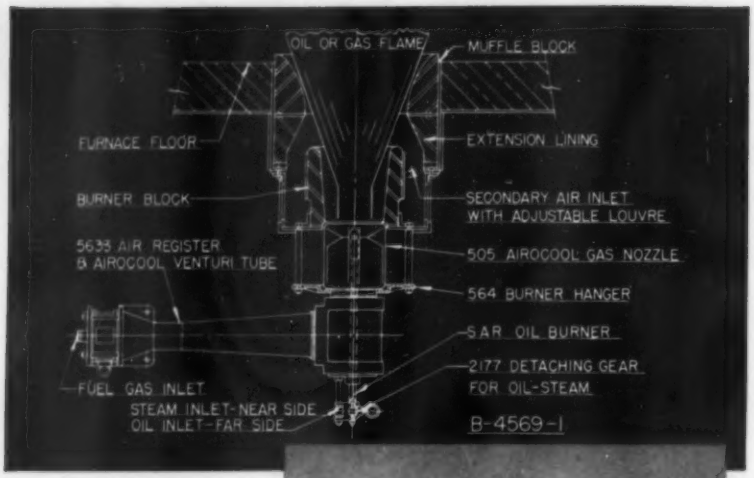
P-30

NAME.....

COMPANY.....

ADDRESS.....

CITY..... ZONE..... STATE.....

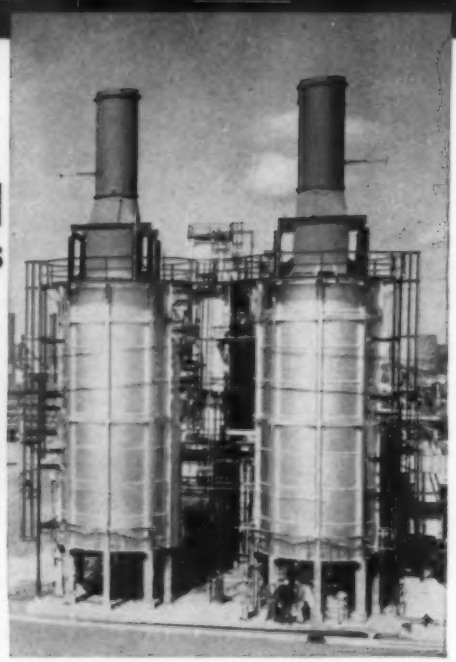


NATIONAL AIROIL

C-P GAS & OIL UNITS

Upfiring

LARGE CIRCULAR OIL HEATERS



These modern Struthers Wells twin furnaces-heaters are located in a major oil refinery in Western Canada. They are vertically fired each with a compact group of *National Airoil* natural draft, high heat release *C-P* combined fuel burner units.

These *C-P* units are designed to realize the greatest combustion economy together with flame mass centrally concentrated for a large proportion of heat to be transferred by flame radiation to the oil tubes thus avoiding destructive flame impingement on the tubes.

Their ease of regulation and combustion control contribute to their overall acceptability.

Ask for our Bulletin #498.

National Airoil

BURNER COMPANY, INC.

Main Office & Factory: **1236 EAST SEDGLEY AVE., PHILADELPHIA 34, PA.**

SOUTHWESTERN DIVISION 2512 SOUTH BOULEVARD, HOUSTON 6, TEXAS

INDUSTRIAL OIL BURNERS, GAS BURNERS, FURNACE EQUIPMENT

tion course, chemical interpretation of infrared spectra, Minneapolis.

10-13 Society of Automotive Engineers, national West Coast meeting, Hotel Georgia, Vancouver, B. C.

12-15 Billings, Mont., Geological Society, tenth annual field conference, Disturbed Belt area of northwestern Montana, registration, August 12, Great Falls, Mont.

26-28 Pennsylvania Grade Crude Oil Association and Pennsylvania State University, twenty-first technical conference on petroleum production, Penn State campus, University Park, Pa.

SEPTEMBER

9-11 Pacific Coast Gas Association, annual meeting, Ambassador Hotel, Los Angeles.

15-17 Texas Mid-Continent Oil and Gas Association, annual meeting, Rice Hotel, Houston.

16-18 National Petroleum Association, annual meeting, Traymore Hotel, Atlantic City, N. J.

20-23 American Society of Mechanical Engineers, petroleum mechanical engineering conference, Rice Hotel, Houston.

21-25 Instrument Society of America, annual instrument-automation conference and exhibit, International Amphitheater, Chicago.

23-24 Western Petroleum Refiners Association, Rocky Mountain regional technical - industrial relations meeting, Henning Hotel, Casper, Wyo.

24-25 Mid-Continent Oil and Gas Association, Louisiana-Arkansas division annual meeting, Roosevelt Hotel, New Orleans.

27-29 National Association of Oil Equipment Jobbers, annual convention and trade show, Hotel Leamington, Minneapolis.

28-Oct. 1 American Welding Society, fall meeting, Sheraton-Cadillac Hotel, Detroit.

OCTOBER

2-3 Association of Desk and Derrick Clubs of North America, eighth annual convention, Hilton Hotel, San Antonio, Tex.

5-7 American Gas Association, annual meeting, Conrad Hilton Hotel, Chicago.

5-10 Society of Automotive Engineers, national aeronautic meeting, aircraft manufacturing forum, and aircraft engineering display, The Ambassador, Los Angeles.

7-8 Western Petroleum Refiners Association, fourth annual stream pollution and waste disposal conference, Broadview Hotel, Wichita.

7-10 Rocky Mountain Association of Geologists, eleventh annual field conference, Saratoga Inn, Saratoga, Wyo.

8-9 California Natural Gasoline Association annual fall meeting, Huntington-Sheraton Hotel, Pasadena, Calif.

8-10 Southwestern Federation of Geological Societies, annual meeting, Lubbock, Tex.

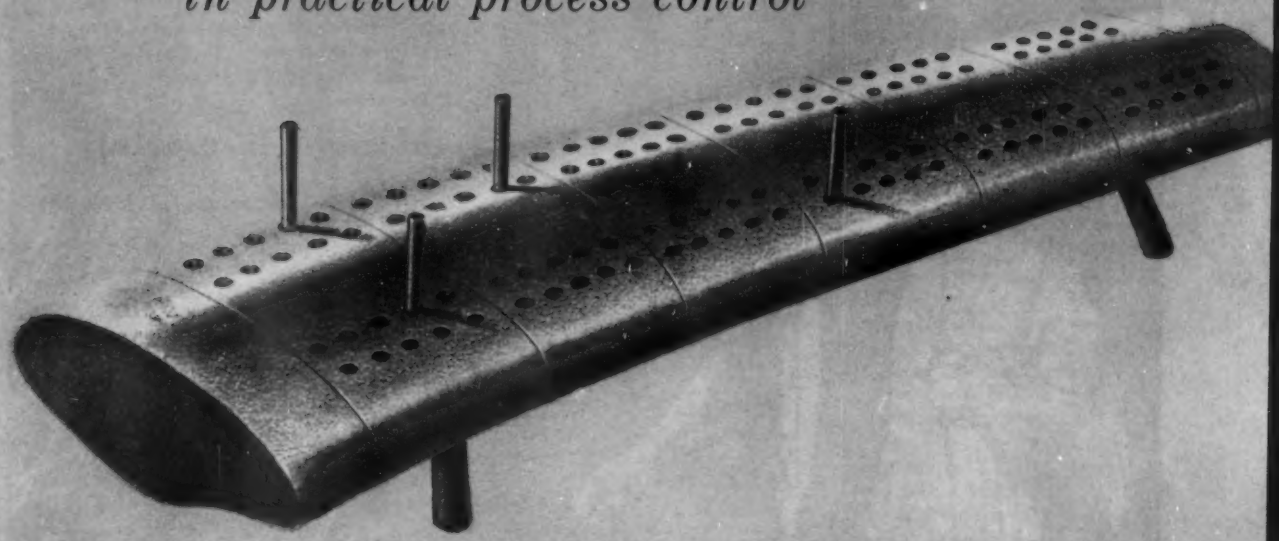
8-10 Exploration Drilling symposium, sponsored by University of Minnesota, Colorado School of Mines, and Pennsylvania State University, University Park, Pa.

8-11 Louisiana Gulf Coast Oil Exposition, Lafayette, La.

11-13 American Association of Oilwell Drilling Contractors, annual meeting, Skirvin Hotel, Oklahoma City.

SEVEN GIANT STEPS FORWARD

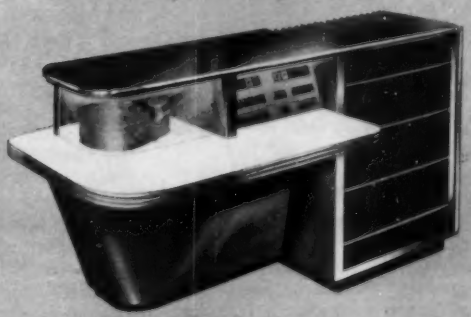
in practical process control



GENESYS

Filling the void in *practical* process control, Genesys now offers reliable, economical computer control systems specifically developed for your requirements. The unique Genesys systems approach provides long needed user benefits at reasonable cost. No precise knowledge of process dynamics is necessary — process operation is optimized through adaptive control methods. Designed from inception as a process control computer, the Genesys System features extreme reliability and simplicity of operation through advanced logical design. Find out how Genesys takes seven giant steps forward in refinery and pipeline automation. Write for "Evolution in Process Control."

Designed and built for industrial and business applications, Genesys Control Computer Systems provide many exclusive advantages at lower cost. Compare Genesys.



GENESYS CORPORATION

10131 NATIONAL BLVD., LOS ANGELES 34, CALIFORNIA

A Subsidiary of CHANCE VOUGHT AIRCRAFT

Progress is a thing easily seen and appreciated by men everywhere—when such progress is so easily demonstrated by CROSE pipeline construction equipment. Crose equipment on the job means more speed . . . more efficiency . . . more economy . . . a symbol of progress in the lives of peoples in many
CROSE
... an international name in pipeline construction equipment
lands. Crose has numerous supply points to expedite pipeline construction work in almost any corner of the world.
FOR THE BEST, USE CROSE—ANYWHERE!
m.j. Crose
MANUFACTURING COMPANY, INC.

2765 DAWSON ROAD • PHONE WEbster 6-2171 • TULSA, OKLAHOMA • BRANCH OFFICES: HOUSTON • DENVER • LOS ANGELES • ELIZABETH, N. J. • IN CANADA: CROSE-CURRAN LTD., EDMONTON, ALBERTA • EXPORT OFFICE: NEW YORK, N. Y.

The OIL AND GAS JOURNAL

TULSA, OKLAHOMA

Published every Monday by The Petroleum Publishing Co., 211 South Cheyenne Avenue, Tulsa, Okla. Phone LUther 4-4411. Founded in 1902. Name changed to The Oil and Gas Journal in 1910 by Patrick C. Boyle.

P. C. LAUINGER
President

S. H. ROURKE
Executive Vice President

KENNETH B. BARNES
Vice President and Editorial Director

MITCHELL TUCKER
Vice President and Advertising Manager

HANSON B. PIGMAN
Circulation Manager

DONALD W. WILSON
Manager Industry Census Department

J. PARKER HOLLAND
Production Manager

ADVERTISING OFFICES

TULSA
211 South Cheyenne, LUther 4-4411
JOHN D. REILLY....Mid-Continent Manager
ROY E. FINLEY.....Representative
D. B. MILLER.....Classified Adv. Mgr.

NEW YORK
500 Fifth Avenue, LOngacre 4-1910
E. S. KLAPPENBACH.....Eastern Manager
HARRY B. BULLEN.....Representative

PHILADELPHIA
1509 Land Title Building
Broad and Chestnut Streets,
RIttenhouse 6-0118
JOHN W. MEANY, JR.....District Manager

CHICAGO
105 West Madison Street, CEntral 6-2537
DAVID T. KENNEY.....District Manager
KAREL WEGKAMP.....District Manager

DETROIT
204 Washington Square Building
Royal Oak, Mich., LIncoln 7-9455
JOHN D. YODER.....District Manager

PITTSBURGH
Law & Finance Building, 429 Fourth Ave.
Room 1505, GRant 1-5847
ERNEST S. HOLZWORTH...District Manager

HOUSTON
802 American Investors Building
CApitol 4-7726
JOHN M. SPEARS.....Gulf Coast Manager

DALLAS
1238 Mercantile Building
Riverside 8-3074
PREN G. HOLLINGSWORTH..Representative

LOS ANGELES
650 South Grand Avenue, MAdison 2-0722
GEORGE O. RUPPERT.....District Manager

ENGLAND
National Provincial Bank Chambers
15 Grafton Street, Altrincham
Phone Altrincham 3160
HARRY BECKER....European Representative

Subscription rates to the petroleum industry United States and foreign, 1 year, $5.00; 2 years, $8.00; 3 years, $10.00. Single copies $1.00. Back copies when over a year old, $2.00. Note: Payments from outside the U.S.A. may be made by international money order, New York exchange, or check on a U.S.A. bank. Second-class postage paid at Tulsa, Oklahoma. Copyright 1959 by the Petroleum Publishing Co.

Member
Audit Bureau of Circulations
Associated Business Papers

JOURNALLY SPEAKING

It's Your Money

WHAT a mess our federal highway finances are in! The President insists that the gasoline tax be increased to cover the deficit. Congress seems inclined to balk at raising the rate. Yet if some money isn't obtained our brave new program of four-lane, limited-access, interstate freeways will come to a grinding halt.

It all could have been avoided, it seems to us, if there had been more adequate planning in the beginning—specifically if the oil industry had taken an active hand in shaping the program.

Now the oil industry is hollering because it is being asked to pay more gasoline taxes to make up an unexpected deficit in the highway fund caused by somebody else's bungling or miscalculation.

So why didn't the oil industry get in there and have a hand in the planning when Congress was wrangling with the original program 3 or 4 years ago?

We have great faith in the ability of the oil industry's economists to make forecasts and to calculate the payout time of a project. We can't help but think that if they had offered to cooperate when the program was being cooked up, their services would have been welcomed and the present program would have been a lot sounder.

But as we recall it, when congressional committees were considering the super-duper highway plan, the oil industry dragged its feet. Only a very few witnesses appeared from the oil industry and they were concerned mainly with two points: They didn't want gasoline taxes increased at all for any purpose; and they didn't want restrictions on filling stations on the new highways.

When it became evident that Congress was going to adopt the plan anyway, then it would seem that the industry should have said: "Okay, if we're going to have to pay for most of it, let's pitch in and help work out a practical plan for spending the money."

The point of this tongue-clucking over what might have been is that it is a good illustration of how and why oil men ought to take a more active part in politics.

"Taking part in politics" too often is considered to begin and end with contributing to a party campaign fund or authorizing a statement criticizing some pending piece of legislation.

This gasoline-tax-highway-finance muddle is an example of "practical" politics.

Sure, gasoline taxes are too high already; and no, they should not be diverted to nonhighway uses. Oh, the industry is right as rain in standing on these principles.

But let's be practical. Legislatures are going to continue to force the oil industry to pay billions in gasoline taxes, principle or no principle.

So the oil industry should "rise above principle," accept the inevitable, and take a hand in seeing that it gets the highways it is paying for.

We can't think of anybody who has a greater stake in either the financing or the use of highways than oil men, but we don't see many of them doing much about it except to keep shouting that gasoline taxes are too high.

Maybe they're too high because the money isn't spent the way oil men—or other businessmen—would spend it.

In Oklahoma, for instance, the state is all torn up with a big political fight over a proposed new system of highway planning, construction, and financing which its proponents say will yield more road per dollar. Every day the newspapers carry big blasts by politicians for or against the plan. The average voter doesn't know who is right.

But we have yet to see an opinion expressed by oil men who are going to collect and fork over most of the dough the politicians are going to spend one way or another, and who are much more experienced than any of the politicians in the wise spending of construction money.

"Practical politics" in such a situation should mean that financial and technical experts from the oil industry would insist on giving impartial advice to legislators and highway officials—for the good of themselves and other citizens and taxpayers — even though they still stand on the principle that gasoline taxes are too high.

—Henry D. Ralph

Another successful use for BAKER Packers... parallel string installations

Baker Retainer Production Packer Product No. 415-D

FEATURES

Holds any pressure from either above or below that is safe for the casing, even under temperatures in excess of 300°F.

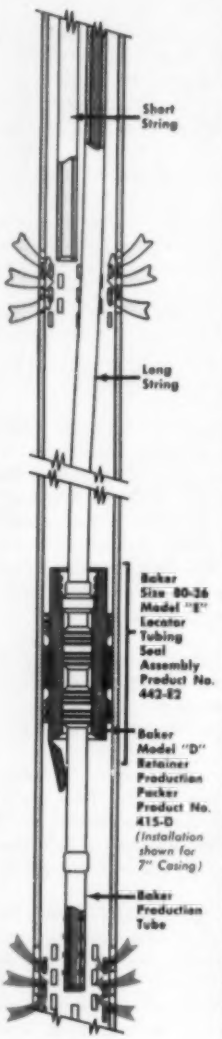
Pack-off is independent of set-down weight or tension. Tubing string is free; just pick up (or unlatch and pick up) to remove it.

Use it as a squeeze and testing tool or as a temporary or permanent bridge plug in conjunction with any production application.

BAKER OIL TOOLS, INC.
HOUSTON • LOS ANGELES • NEW YORK

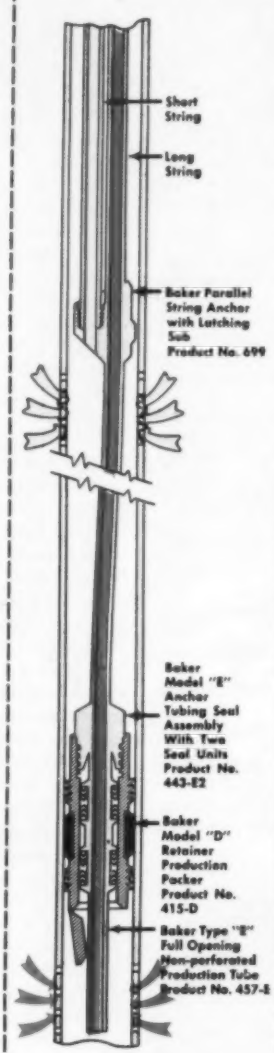
BAKER

DUAL ZONE parallel string SHORT STRING HANGING FREE


Short String
Long String
Baker Size 80-26 Model "E" Locator Tubing Seal Assembly Product No. 442-E2
Baker Model "D" Retainer Production Packer Product No. 415-D (Installation shown for 7" Casing)
Baker Production Tube

Permits removal of either string independently of the other regardless of sequence. Full-Opening (Tubing I.D.) Long String to lower zone.

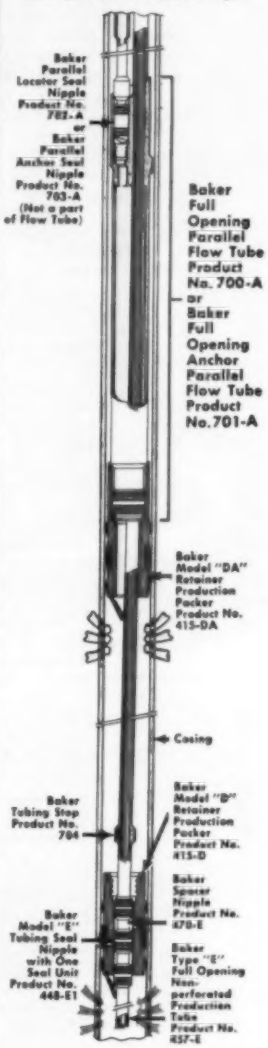
DUAL ZONE parallel string SHORT STRING ANCHORED


Short String
Long String
Baker Parallel String Anchor with Latching Sub Product No. 699
Baker Model "E" Anchor Tubing Seal Assembly With Two Seal Units Product No. 443-E2
Baker Model "D" Retainer Production Packer Product No. 415-D
Baker Type "E" Full Opening Non-perforated Production Tube Product No. 457-E

Permits removal of either string independently of the other, however long string must be run first. Short string pulled first. Full-Opening (Tubing I.D.) Long String.

DUAL ZONE parallel string TWO-PACKER HOOK-UP*

*Ask for details of "Retrievable Upper Packer" installations, and other parallel string hook-ups.


Baker Parallel Locator Seal Nipple Product No. 703-A or Baker Parallel Anchor Seal Nipple Product No. 703-A (Not a part of Flow Tube)
Baker Full Opening Parallel Flow Tube Product No. 700-A or Baker Full Opening Anchor Parallel Flow Tube Product No. 701-A
Baker Model "DA" Retainer Production Packer Product No. 415-DA
Casing
Baker Tubing Stop Product No. 704
Baker Model "D" Retainer Production Packer Product No. 415-D
Baker Spacer Nipple Product No. 470-E
Baker Model "E" Tubing Seal Nipple with One Seal Unit Product No. 448-E1
Baker Type "E" Full Opening Non-perforated Production Tube Product No. 457-E

Illustrates Two-Packer parallel string installation with each zone confined to its individual tubing string with full-opening to lower zone for use of all permanent-type completion tools.

Let's hold down cost of steel—and of oil

THE UNITED STATES has been pricing itself out of world markets for the past dozen years. Now it is in danger of pricing itself out of its own market.

Our export market for oil is gone forever, and we have had to erect barriers against imported foreign oil. This is due chiefly to the fortuitous location of big reserves, but in part to lower labor costs and to operating efficiencies abroad.

In manufacturing industries, the high costs which put our goods at a disadvantage are all of our own making. We are the victims of our too-rapid spiral of living standards and wage rates.

OIL-INDUSTRY EQUIPMENT is a case in point, well illustrated at the International Petroleum Exposition. This has long been an American specialty. Until recent years all but a negligible percentage of the equipment used by oil operators throughout the world was of U. S. design and manufacture.

Now manufacturers in several foreign countries are bidding actively to equip refining, pipeline, and production projects abroad, and getting some good contracts. They are not only cutting into our export markets, but with some items, such as pipe, are threatening to invade our home market.

Competition is good. It can be met in many ways besides price. But when we as a nation deliberately raise our costs so that the price disparity becomes too great to be offset by other factors, then we should resign ourselves to handing big chunks of our markets to our competitors.

This spring the oil industry, with little general resistance, gave its employes a wage increase across the board. In most cases the companies probably couldn't afford it and the beneficiaries probably hadn't earned it. Oil prices didn't rise immediately but they will eventually, so this put another peg in the inflationary spiral.

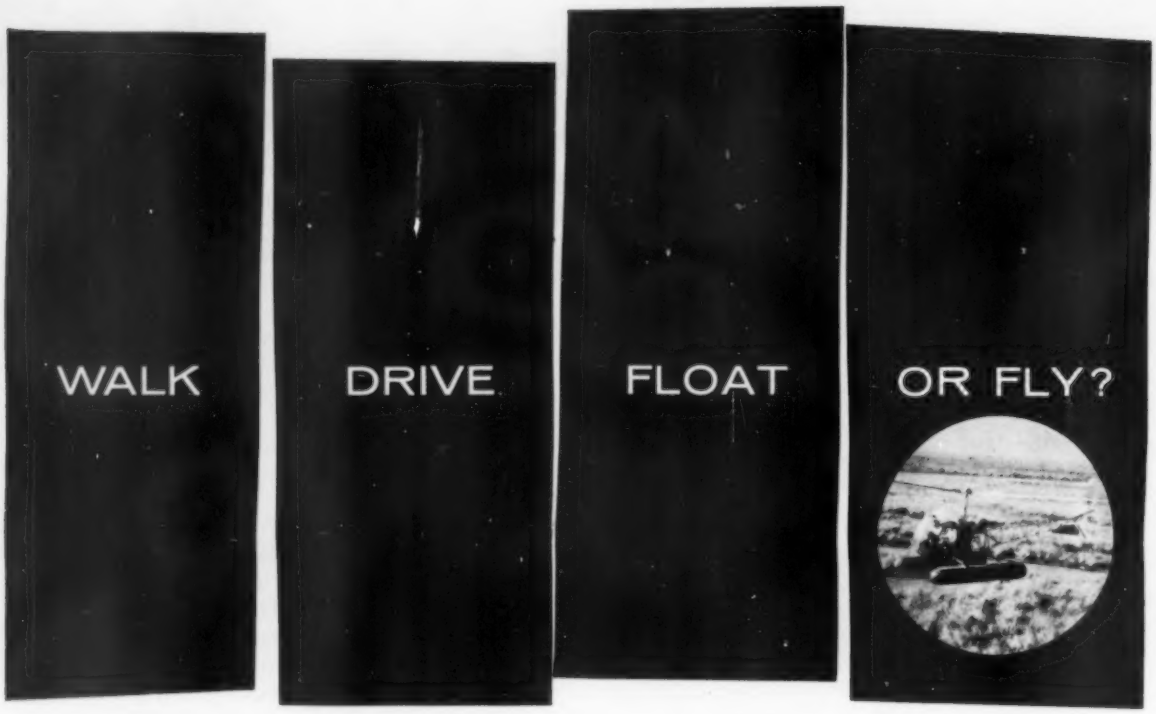
This summer the nation will learn whether steel wages and steel prices will boost that spiral higher or whether somebody or something will bring it to a halt.

Within limits the United States can support a higher wage scale and a higher living standard than other nations, and compete on the basis of quality, productivity, service, and technological advances. But other nations are catching up with us on all these.

IF STEEL WAGES GO UP, so will the price of steel and so will the cost of every American manufacture. The price disparity between oil equipment of U. S. and foreign manufacture in the export field will widen. Foreign oil will get still another cost advantage over domestic.

Oil men, like steel workers and all the rest of us, have been too concerned with the effects of inflation to give thought to its causes. But if we as a nation don't tighten our belts and take painful measures to cut costs and increase efficiency, we may have no belts left to tighten.

DO YOUR EXPLORATION PLANS SAY



Try this Bell Pencil Test. Quiz yourself; see how much you know about the oilman's most versatile helper — the helicopter.

YES	NO	
☐	☐	Fast, low-level mapping could cut our exploration costs.
☐	☐	Problems in rugged terrain slow our seismic crews to a crawl.
☐	☐	We would like our swamp crews to make 4 or 5 times as many shots per month as they now do.
☐	☐	We can lose $200 per hour on a back-country location, waiting for parts, trouble shooters or material.
☐	☐	Road-building costs are holding up important shot tests.
☐	☐	Our key personnel could handle more than one job — with quick, dependable transportation.
☐	☐	Inspection trips keep our production executives on the road too long.

Now tear out this page and mail it — with your name, title, company and address — to: Department 26E, Bell Helicopter Corporation, Fort Worth, Texas. We'll send you additional information about the Bell's role in Oil.

BELL
HELICOPTER CORP.

FORT WORTH, TEXAS • SUBSIDIARY OF BELL AIRCRAFT CORPORATION

What the IPE Taught

• The years ahead will provide better, lighter, more automatic equipment for all divisions of the industry

THE TOOLS that do the oil industry's back-breaking work have become more rugged, more technical, and more expensive in the last 6 years.

That's the general impression carried away from the Fourteenth International Petroleum Exposition which last week closed one of its most successful shows in Tulsa.

The show this year was larger and better attended than the last one in 1953 or any of those held periodically since 1923. It furnished a fitting celebration for the oil industry's 100th birthday.

Already rated the largest single-industry trade show in the world, the IPE of 1959 again had the necessary ingredients of:

. . . Plenty of people.

Record throngs were on the 30-acre show grounds nearly every day, climaxed with a Sunday turnout of nearly 84,000.

. . . Plenty of exhibits.

More than 1,500 companies which serve the oil industry put on display equipment valued at more than $500 million.

Some few of the items represented technical innovations. Many others showed model improvements. And the bulk of the equipment was bread-and-butter items standard to several competing suppliers.

Big sales . . . Against this backdrop of big crowds and shiny industrial hardware, several companies announced some juicy sales during the show.

Dresser Industries announced a contract with Southeastern Drilling Co. of Argentina, S.A., involving more than $10 million initially.

National Supply also announced two big sales to Mexico. Perforadora Mexico, S.A. contracted for two National type 55 drilling rigs with costs totaling about $1.3 million. An almost identical sale was made to Permesa, S.A.

Caterpillar Tractor Co. sold more than 50 engines of various types.

Franks Division of Cabot Shops, Inc., Pampa, Tex., announced sales totaling nearly $500,000 in the first few days of the show.

Many other companies reported sales in the making, and their salesmen commented freely that they were impressed by the number of inquiries from oil men viewing the exhibits. But more important, the interest came from men who actually buy or use

NATIONAL SELLS two complete rigs to Permesa, S.A., new Mexican contractor. Signing the contract are Ing. Jorge P. Mendez, right, head of Permesa, and Robert Meyer, left, National vice president. Looking on are Pascual Gutierrez Roldan, center, director general of Pemex; Fernando Padilla, left, Pemex subdirector of finance, and J. M. Estrop, of National Supply of Mexico.

TWO MORE RIGS go to another Mexican drilling contractor, Perforadoras Cerro Azul, S.A., of Tampico, in deal with Ideco, Inc. Sealing the $1,000,000 deal at the IPE are Jorge Ramirez, left, president of Perforadoras Cerro Azul, and G. W. (Jack) Walton, Ideco president.

equipment, which could produce sales months later.

Production tools . . . The industry's production men showed keen interest in several pieces of equipment which went on display for the first time at the show.

They included:

. . . Wire-line multiple completion tool which eliminates need for multiple strings of tubing in a well. It can produce and "prorate" below ground two or more zones in a single tubing string.

. . . Triple-zone hydraulic pumping unit. It can handle as many zones down to 11,250 ft. as operator can get tubing strings in the well.

. . . Well pumping unit of unconventional design which achieves 94% efficiency. Only basic components are a ball-nut actuator and a screw shaft.

. . . Waterflood package containing both engine and pump in a single unit. New flexible coupling permits operation of pump directly off shaft of engine.

. . . New approaches to automatic well-testing and instantaneous recording of bottom-hole pressure on wells producing by waterflood.

More efficient pumps, valves, and fittings designed to lower the oil man's lifting and producing costs were claimed by many manufacturers.

Drilling outlook . . . Crowds got a good insight into the battle involving mechanical and electrical drives.

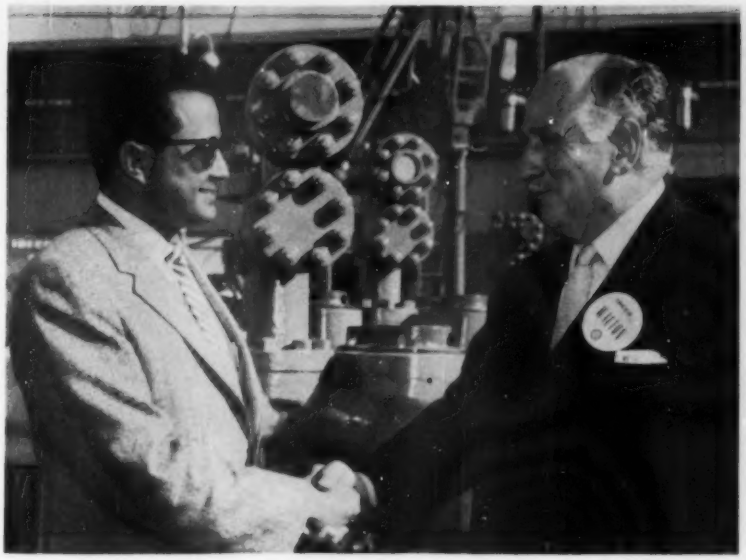
The contest will decide whether the electric drive will take more or perhaps most of the drilling rig market away from the straight mechanical drives. A secondary contest is being waged by enthusiasts of gas-turbine engines who want to take the prime-mover market away from piston engines.

All factions had excellent models of their products on display, and the consensus of oil men was that no matter which wins, the driller will be ahead. He'll wind up with a rig drive which will be lighter, more portable, more flexible, and more dependable.

Other show features of interest to the driller included a turbodrill in actual operation, slim-hole tools, new electric logging and portable spectrometer unit which measures radiation to help the geologist.

Another exploration innovation—microbial prospecting—also made its first oil show appearance. Micro-organisms in the soil live on hydrocarbon gases which escape to the surface from oil deposits. Thus presence and

SOLD SIGNS on equipment behind Dresser Industries building testify to show's success. From left is an Ideco MM 1000 Mudmaster mud pump sold to Gardner Bros. Drilling Co. (Canada); an Ideco MM 1250 Mudmaster mud pump going to Hunt Drilling Co., and (behind christmas tree) an H-25 Ideco Rambler rig bought by Clayton-Gaddy Well Servicing, Inc., of Odessa, Tex.



activity of these microbes in an area is an indication of petroleum deposits, its advocates claim.

Pipelining . . . The emphasis on big-inch pipe for natural-gas trunk lines made itself felt in the pipeline equipment.

Bigger equipment came to the show, tractors with greater lifting power and larger engines, other tools for handling the large-size pipe.

Other features for pipeliners: Remotely controlled pump station, turbo-charged gas engine, automatic data handling systems for field operations, automatic pipe welding machine, and new emphasis on plastic and aluminum pipe.

Refiners . . . The smaller hardware was on display for refiners in the oil industry, but it revealed the inroads of automation being made.

Some of the newer wrinkles revealed:

. . . Method of training operators in a full size simulated control panel for a fluid catalytic cracking unit. A relatively low-cost project, it uses dummy instruments which show proper response when upset conditions are fed into the unit by the instructor.

. . . Continuous end-point measurement which promises to become incorporated into direct instrument control of a fractionator to maintain steady product specifications.

. . . Simplified system for maintaining constant internal reflux in a distillation tower using conventional electronic and pneumatic instruments and an analog computer.

. . . New chemical powder for fire fighters in refineries which will prevent foam disintegration.

Foreign influence . . . Overseas visitors got the royal treatment.

More than 2,000 representatives from 48 countries registered at the show and carefully examined the equipment.

Influence of foreign manufacturers also was strong on the show grounds. Several equipment firms from abroad exhibited and drew serious attention from oil men.

Some of the foreign exhibitors said their primary aim was not to import into the domestic American market but to sell to the world oil industry outside the United States.

One of the show's curiosities was the mammoth French truck manufactured by Automobiles M. Berliet.

President of the firm, M. Paul Berliet, announced at the show his company has developed an engine which burns "any liquid which has heat value." This includes unrefined crude oil, whale oil, vegetable oil, kerosine, kitchen cooking oil, or even hair dressing.

The "magic motor" is designed for military and industrial use but could be converted to the family automobile, Berliet said.

When next? . . . Exhibitors and visitors alike termed the 1959 IPE beneficial.

Equipment people generally felt that the sales and contacts made with right people throughout the industry made the expense and trouble worthwhile. Similar sentiments were expressed by oil men who were able to see spread out at one time the more important tools of the industry.

IPE officials said the next show probably will be held within 5 or 6 years when sufficient developments in equipment make another exhibit attractive.

TOP HOST, Oklahoma's Gov. J. Howard Edmondson, welcomes an anticipated 500,000 visitors to IPE during official opening ceremonies. On the speakers' platform (right to left) are: Gen. Alfred Gruenther, head of International Red Cross; James L. Maxwell, mayor of Tulsa; Glen Condon, master of ceremonies; Gen. E. O. Thompson, principal speaker; and Wendell Barnes, head of the Small Business Administration who delivered greetings from President Eisenhower.

FROM BRAZIL . . . the nation's two top drilling contractors came to shop at the IPE. They are P. Pisani Perrone, left, of Sao Paulo, and J. C. Laport, Rio de Janeiro.

FROM INDIA . . . came a group of representatives from the New Delhi government. Among them was R. L. Sarna, right, who is shown chatting with L. Valat of Paris, France.

Visitors From Abroad Set IPE Record

FROM FORMOSA . . . are four agents of Chinese Petroleum Corp. who talk of a 12,000-ft. wildcat on their island with a rig already shipped. Shown left to right are T. M. Wu, exploration director E. K. Zah, chemical engineer; Y. F. Yang, chief exploration-production; and C. Y. Meng, gelogist.

TWO thousand representatives from 48 nations visited the IPE during its 11-day run.

They represented governments, oil companies, equipment agencies, or finance houses abroad.

They came in record numbers to look, pick up information on the latest developments in equipment, and even often to buy.

Visiting delegates also were honored at a variety of social events during their stay in Tulsa. They were guests at an elaborate outdoor reception at Southern Hills Country Club attended by 3,000 show visitors. Dozens of private business dinners and parties also were held for them.

Many foreign visitors made trips to research laboratories in Bartlesville. Others were flown to Borger, Tex. for a tour of oil operations there.

Some visiting governmental representatives had private audiences with Gov. J. Howard Edmondson of Oklahoma.

There were 11 exhibitors from other lands. The display of Eisenwerk Wulfel of Hannover, Germany, was typical. This company spent about $45,000 in shipping a light rig and other heavy-duty machinery from Germany, setting up the exhibit and paying transportation costs for booth attendants.

FROM COLOMBIA . . . the official government oil agency sent a strong delegation. Left to right are Marco Aurelio Arango, Bogota, president of Empresa Colombiana de Petroleos (Ecopetrol); Miss Marta Lobo Guerrero; Eusebio Gomez, superintendent of El Centro field; Alberto Lobo Guerrero, Ecopetrol vice president; and C. J. Watson, Phillips Petroleum Co., their host.

FROM GERMANY . . . three industrialists from Alfred Wirth & Co., Erkelenz, West Germany, expressed interest in extending credit to Latin American governments to buy metal goods. Pictured are, left to right, Wilhelm Hildebrand, Al Teigeler, W. H. Horster, Tulsa building contractor and their host, and Werner Mueller, chief executive officer of the Wirth organization.

FROM FRANCE . . . three representatives of Automobiles M. Berliet of Paris were greeted by Oklahoma Gov. J. Howard Edmondson, left. They are Paul Berliet, head of his firm; Ray Thouin, executive vice president; and Bernard Musnik, public relations director.

DRILLING at the IPE

- Competition between electric and mechanical drives promises better, lighter rigs in the future.
- Mud pumps are getting lighter, too. This means more power per pound, lower moving costs.
- Gas turbine shows up as prime mover on one rig, indicating a battle in the future with piston engines.

Future Rigs: Mechanical or Electric?

• No matter which way it turns out, the competition between these two drives will mean lighter, better rigs for the oil industry. Also to be decided, will these rigs of the future be powered by piston engines or gas turbines?

THE DRILLER at last week's International Petroleum Exposition was treated to the sight of mighty forces ready to do battle for his favors.

Arrayed against each other were two factions. A third stood on the sidelines ready to take the field with them.

The contest is to decide whether the electric drive should take more, or perhaps most, of the drilling rig market away from the straight mechanical drive.

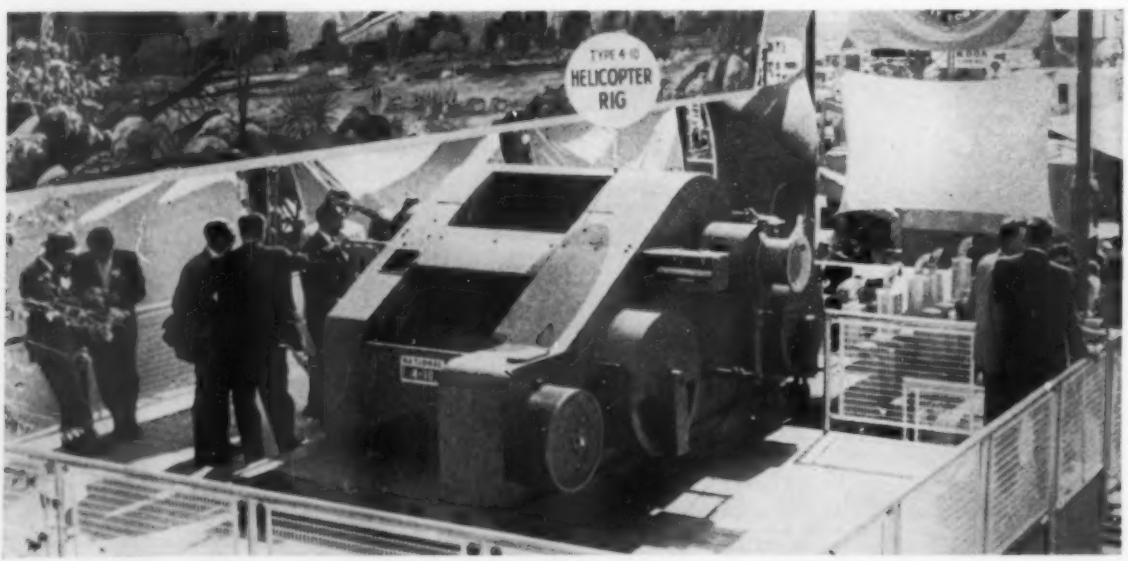
The third group is gas-turbine enthusiasts, who don't seem concerned about the outcome but rather about whether the prime mover should be a piston engine or one of their own products.

Regardless of which type drive and prime mover finally prevails, the eventual winner is certain to be the driller himself. He'll reap rewards in a rig drive which will be lighter, more portable, more flexible, and more dependable than any he's known in the past.

Who's in the fight? . . . Arrayed in favor of the electric drive are several groups.

In front ranks are those manufacturers who were already in the business of making diesel-electric packages for duty in locomotives for the railroad industry. These manufacturers hope to take advantage of their volume production to carve a big place for themselves in the drilling-rig-drive market.

Also on the electric-drive side, but pulling in a slightly different direction, are those manufacturers of engines and of electric gear which have teamed up to produce engine-generator sets especially for drilling use. These firms hope that by combining forces they can win the market not only away from straight mechanical drive but also away from the railway-type equipment.



MECHANICAL RIG displayed by National Supply Co. is designed for helicopter transportation. It breaks into 4,000-lb. loads for hauling into remote areas.

Opposing both these groups and pulling for straight mechanical drive are those engine manufacturers who market no engine-generator packages. They are allied with the firms which make chains, clutches, torque converters, fluid couplings, and other equipment which is common to mechanical rigs but which is little used on electric rigs. These firms would like to hang onto a market which has long been theirs.

The gas-turbine people, still mostly on the sidelines and small in proportion to the other forces, say they would be willing to tie their power plants either to chains for a mechanical drive or to a generator for electric drive.

Thus far, the engine manufacturers on both sides of the electric-drive struggle are confident they will not have to quit the present fray to protect themselves from onslaughts by this new foe.

GAS TURBINE rated at 500 hp. was the surprise in rig drives. It is mounted on a Continental-Emsco T-97 trailer rig and occupies less space than just one of the two piston engines for which the rig was designed.

What they say . . . Proponents of electric drive at the oil show cited the speed with which their equipment may be rigged up.

You can just "plug the equipment in," they said; there are no chains to make or break. And, the engine-generator sets can be placed most anywhere on the location.

Several loads can be driven by current from a single generator. And, control is simpler, easier, and smoother than in a mechanical-drive rig.

The mechanical-rig faction says that some of these things may be true but there's more to the story. First, drilling people seldom have a working knowledge of electricity. They can maintain mechanical-drive equipment, but an electrician must be hired to maintain electric gear. Moreover, electric rigs are more expensive than mechanical ones.

And, they insist, with modern air clutches, torque converters, and fluid couplings, their rigs compare favorably with any other for ease and smoothness of control.

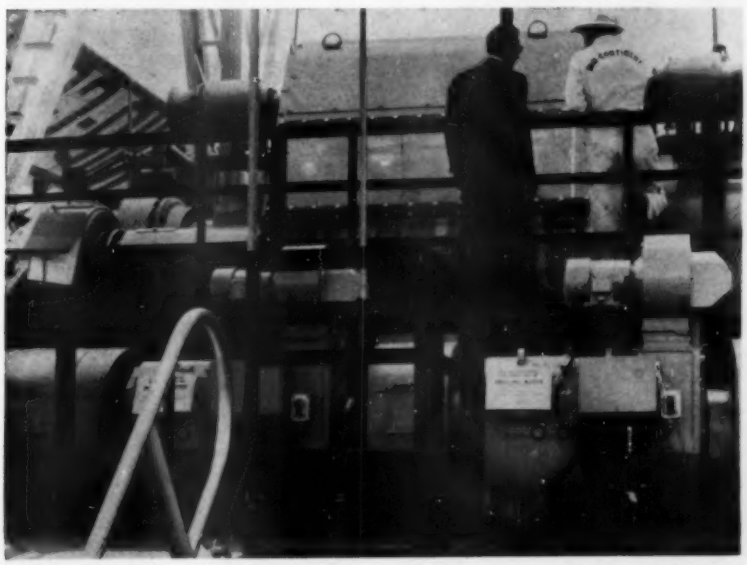
Mechanical still in saddle . . . Most rigs at the show had the straight mechanical drive that has prevailed since the steam rig faded into near oblivion two decades ago. But, in sharp contrast to the last oil show, this time there is competition from other drives.

Making the biggest inroads were electric-motor drives. On several of the bigger rigs at the show, d.c. motors drove the draw works. Exhibits of engine manufacturers and electric-equipment manufacturers were liberally sprinkled with engine-generator sets for drilling-rig use.

For the engine manufacturers, the rumble of far-away thunder sounded from the exhaust of a 500-hp. gas turbine displayed on a portable rig. This application of the turbine to draw works drive (straight mechanical in this case) is entirely experimental; so far as is known, none has ever been used for actual drilling.

In spite of this, thousands of drilling men scrambled over the Continental-Emsco T-97 trailer rig on which the turbine was installed. All were impressed by the compactness of the machine, which left unused much of the space originally set aside on the rig for conventional engines.

Continental-Emsco engineers said that in assembling the turbine drive, their primary intent was to make a rig which can be transported easily by air. But most of the drillers were thinking what an advantage such a small prime mover could be on an oft-moved rig which must be hauled over highways and roads.



ELECTRIC RIG was Mid-Continent Supply's U-712-A. Two 625-hp. GE motors drive it. There were no electric drives shown in 1953.

Blows struck for engines . . . The gas turbine didn't steal all the attention.

Engine manufacturers came with many new features to gain favor for their products.

Net effect of many of the new features is to prod more horsepower out of each pound of engine weight. And, more horsepower per pound means lighter, more portable engines.

One manufacturer got a lot of attention with his diesel engine which is air cooled instead of water cooled. The company pointed out that an air-cooled engine, besides being lighter, also has no problems of freezing in cold weather. Moreover, there is no corrosion or scaling in the radiator or water jacket. These problems can be especially bad where water is scarce or hard.

Another firm brought to the show a new engine which can be converted from diesel to gas or back to diesel on the rig in only a few hours. This conversion is made by changing out fuel-injector units and a few other parts.

A major manufacturer of railroad-type engine-generator sets showed modifications of its original diesel engines to make them gas burning.

Still another introduced a new series of V-type diesel engines which, because of their compactness, get more horsepower per pound of engine than do in-line engines.

Almost all engine manufacturers prominently displaced turbo-supercharged models. By cramming more air into the cylinder on every stroke, turbocharging gets as much as 25% extra power out of the same engine.

Some don't care . . . The bigger manufacturers of engines generally showed complete lines of engine sizes.

These lines included models with horsepower ratings generally suitable for use on mechanical-drive rigs. The lines also included models, usually larger, suitable for electric drive.

Such manufacturers were just as pleased to sell one product to drive generators as to sell another for mechanical drive.

Some, however, have joined with electric manufacturers to put out a package containing both engine and generator for electric drive. Thus, they have a market in either electric or mechanical drive. Other engine manufacturers have not gotten into the making of such packages and continue to stress the mechanical drive.

Competition is strong between the firms which are primarily engine manufacturers and those which make not only engines but also engines and generators for railroad-type units.

In fact, this type of competition has brought two divisions of General Motors Corp. into the position of selling against each other. The Electro-Motive Division makes railroad-type equipment. The Detroit Engine Division makes the engines for use with another firm's generators and motors. Both these sister divisions had exhibits of their electric drives at the show.

Where rig makers stand . . . Rig manufacturers hesitate to take a strong stand in the electric-vs.-mechanical controversy. Most of those at the oil show stood ready to give the driller whichever he prefers.

However, the rig manufacturers are quick to admit that they have a financial interest in the question. They can lose by a big swing to electric drive since they also make the engine compounds which are used only on mechanical drives.

The electric-motor manufacturers, also represented at the show, would like to see the rig manufacturers take the lead in still another experiment in electric drives. They believe their high-starting-torque motors would make it possible to use a single-speed draw works. That is, instead of having a shifting transmission, the draw works would depend on a variable-speed d.c. motor to supply the power needed without shifting gears. To demonstrate the point, one electric-motor manufacturer at the show exhibited a motor it used for such a single-speed draw works being placed in service for sulfur drilling.

Turbine weight, 3,000 lb. . . . Basic parts of the turbine demonstrated at the oil show weigh only about 2,860 lb. Height is about 42 in.; length, 98-in.; and width, about 22-in. Solar Aircraft Co., which makes the machine, says that it can operate on almost any fuel. It can run on all refined liquids including kerosine, gasoline, natural gas, butane, and propane.

It can be converted from liquid to gaseous fuel in less than 2 hours, its maker claims.

The gas turbine may be operated in any temperature from —65° to +130° F. And, Solar says, it needs no warm-up period.

Precise fuel consumption of the turbine in drilling-rig service is not available. It is generally conceded to be considerably higher than with piston engines.

Besides Solar, at least three other manufacturers of aircraft-type gas turbines displayed models which they hope to convert to oil-field service.

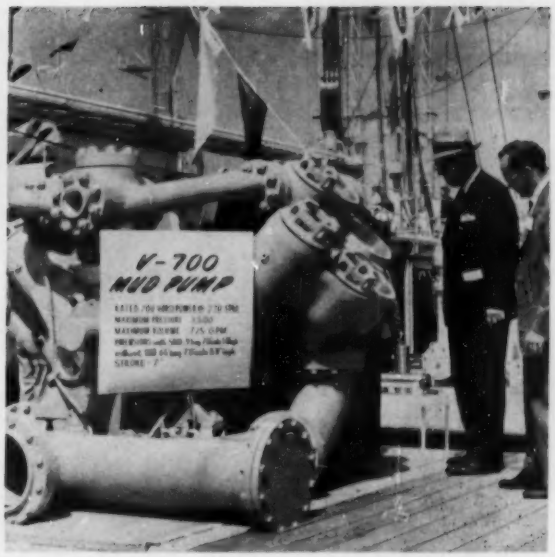
Old Company Enters Drilling-Rig Field

COMPETITION in the market for drilling rigs has become even stronger, with an old-line manufacturer of oil-field equipment moving into the rig field for the first time.

Gardner-Denver Co. exhibited its first unit at the show and simultaneously announced sale of the rig to Jett Drilling Co., Shreveport. An identical rig has been sold to Penrod Drilling Co. of Dallas. The powerful rig is rated at 2,100 hp. but is built in a single piece. Total weight is 64,000 lb. It is, Gardner-Denver officials said, the biggest rig ever constructed in a single unit.

Jett expected to move the rig to Citronelle field in Alabama after the oil show and use it for drilling wells below 20,000 ft.

NEW 6-PLUNGER mud pump with two fluid ends. This 650-hp. model is intended for deep jet drilling, slim-hole work, casing and tubing testing, and even fracturing.



NEW 700-hp. V-type plunger pump, added by Cardwell Manufacturing. Rated speed is 220 strokes per minute—to make up for plunger pumps' single-acting design.

Mud Pumps Are Getting Much Lighter

• Stronger metals, better design are being used to cut important pounds off conventional pumps. Also seen at the show: A new pump using planetary gears, the first two commercial plunger-type pumps in recent years.

AFTER trudging about the IPE for several days, most oil men went home weighing less than when they started.

But, these lost pounds weren't the most important ones missing at the show.

Most important, as well as the most likely to stay lost, were the pounds trimmed off mud pumps since the last oil show.

Most of the reduced-weight mud pumps were of conventional design. The excess pounds had come off as the manufacturers took advantage of stronger metals and improved design, to reduce dimensions.

Or, some manufacturers used these means to uprate their pump lines. That is, what might have been a 350-hp. pump before became suitable for 450-hp. service although dimensions and weight remained the same.

Besides these evolutionary changes in pumps, there were some revolutionary ones as well. Two manufacturers brought along plunger-type pumps, the first offered commercially for mud-pump service in many years.

Another showed a new pump which uses planetary gears instead of the herringbone gears in the power end.

Both the plunger design and the planetary-gear arrangement are more compact and lighter than those in common use today.

Opposed-piston horizontal . . . Gardner-Denver Co., long-time manufacturer of conventional mud pumps, came up with the most startling new look in pump design.

The firm introduced for the first time two models of a new 6-plunger pump which has two fluid ends, one at either side of the input shaft. And, Gardner-Denver says, it is possible to repair one fluid end while the other is pumping away.

Each fluid end has three horizontal plungers. Manifolds can be mounted on either side and, because of a double-extended jack shaft, the drive can be on either side.

One model is rated at 650 hp., can put up 5,000 psi., but weighs only 27,100 lb. The other is a 300-hp. model rated at 3,300 psi. and weighing merely 14,000 lb.

The manufacturer says that the plunger pump can be used for all drilling. However, its special benefits come where pressures are high, as in jet-bit drilling at depth, in slim-hole drilling, coring, testing tubing and casing, and the like.

New V-type model . . . The other plunger-type drilling-mud pump on display at the show was a V-type exhibited by Cardwell Manufacturing Co. Cardwell introduced the general design about 1 year ago. However, a 700-hp. model has been added to the 1,500-hp. size originally built.

The new 700-hp. model weighs 16,000 lb. compared to the 24,000 lb. of the 1,500-hp. model. The smaller pump is rated to 3,500 psi. and the larger to 4,000 psi.

According to Cardwell representatives, there are four of the larger models now in service.

Low silhouette . . . The Wheland Co. displayed the pump with a planetary-gear power end.

Wheland says that with this type drive, they have been able to lower the height of the power end to only 5 ft. 1 in. including the skid.

Fluid end of the pump is conventional double-acting duplex style. However, the crosshead is completely cylindrical instead of having the sides flattened, as in older designs. The maker says the "perfect-circle" crosshead insures perfect alignment.

The model displayed at Tulsa is rated at 600 hp. and 2,600 psi.

PRODUCTION at the IPE

- New equipment will give instant reading on bottom-hole pressure or make automatic tests.
- Novel pumping unit applies auto-steering gear principle to get extreme efficiency. It'll hit the market within 6 months.
- First wire-line multiple-completion tool put on exhibit. It's very attractive for slim-hole completions.

Push a Button, Read Your Well's BHP

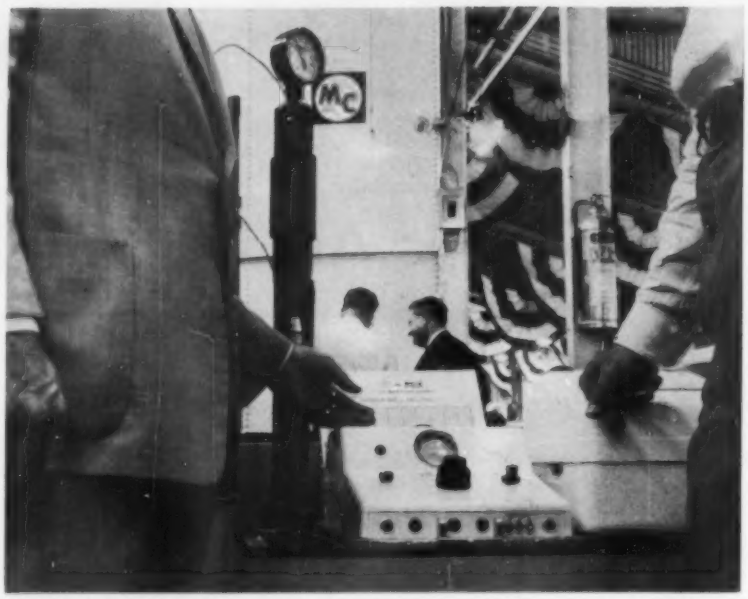
• German-made tool, sold by Otis, may prove a boon as waterflooding control.

SOMEWHERE near Charlotte in South Texas a field man for a major operator is pushing a button and getting an instantaneous bottom-hole pressure reading on a water-flood producing well.

This is one of about 40 commercial installations of a revolutionary new device which gives a producer a constant check at the surface on either flowing or shut-in bottom-hole pressure of his well.

The device was placed on the U. S. market by Otis Engineering Corp. April 24. It was exhibited for the first time in this country during the IPE. Manufacturer is Maihak Corp., Hamburg, Germany.

Basically, the unit consists of a small transmitter opposite the pay zone and a receiver at the surface, with the two connected by durable, heat-resistant wire.



NEW PRESSURE DEVICE gives producer constant, reliable reading at surface of bottom-hole pressure in his well. Promising future is seen for such units as means to tighter control of secondary-recovery projects.

How it works . . . The stainless steel or monel receiver fits into a bracket on the outside of the tubing.

Well pressure causes a small wire in the transmitter to vibrate constantly, disturbing a magnetic field, and creating an electrical impulse up the connecting wire to an oscilloscope type receiver at the surface. The reading in kilocycles on the receiver is easily and quickly converted to correct bottom-hole pressure via a conversion or calibration chart.

The simplest rig permits the operator to read a well's pressure at any desired time by pushing a button on the receiver. A chart recorder can be hooked up so as to give a constant recording.

Another optional feature, a safety device, can be incorporated so as to shut in the well should pressure exceed or fall below desired maximum or minimum levels—and start production again when pressure is again back within the "safe" bracket.

The pressure instruments now offered producers by Otis are designed for various maximum bottom-hole pressure service, depending on model, up to 5,000 psi.

They are accurate to 2% if not compensated for temperature —to 0.25% if temperature compensated.

They will give accurate service, Otis claims, for the life of the well.

The wire used to connect the transmitter to the receiver comes with either plastic or fiberglass coating. The plastic-coated wire withstands temperatures of up to 250° F. without damage. The fiberglass version functions satisfactorily to 500° F.

The cost . . . Cost of installing a complete basic system including transmitter, wire, and receiver to handle bottom-hole pressures up to 4,200 psi. runs roughly between $1,600 and $1,800.

The exact cost depends on depth of the well and the consequent length of wire required.

The receiver unit lists at $1,300, the transmitter at about $280, and the wire about $18 per thousand feet.

Low-pressure systems are available to handle anything from zero to 1,150 psi.

Industry response to introduction of the new pressure system, Otis reports, has been phenomenal. The first supply received from the German manufacturer, 40 complete units, was quickly sold when put on the market for the first time April 24.

Automatic Field, Well-to-Data Card, Arrives

PREDICTIONS of a completely automatic oil field are no longer a look at the future. The automatic oil field is here.

Garrett Oil Tools, a division of U. S. Industries, Inc., announced at the IPE the development of an automatic programer that will test, in a predetermined sequence, all the wells on a lease. The length of each test can be pre-set, too.

This equipment features:

... **Off-the-shelf** components.

... **Building-block design** to permit easy expansion as more wells are drilled on the lease.

... **Remote** manifold control.

... **Simple operation.**

... **Adaptability** to any data handling system.

The automatic programer isolates one well in the test manifold and routes the production from that well to a separator and treater. Produced fluids then go to the automatic metering device, and oil, gas, and water volumes are measured.

A Simplex recorder prints the lease and well identification, the date, and the meter readings at the end of the test. Also printed is an initial reading showing that the meters were cleared at the start of the test.

A punch-tape recording unit can be included in the system if electronic data handling is to be used. This duplicates the entries on the printed form but prepares them for transmission.

The tape is punched in a position number code so that it can be read in the field. Data on the tape is sent to a remote translator which prepares a printed form or card for use in automatic data-handling equipment.

RECORDER, left, prints data; punch-tape unit, right, prepares it for remote translator.

"Atom Smasher" Logs Wells in Field Tests

THE PRINCIPLE of the Van de Graaff generator—in miniature form—has been incorporated in a new high-energy neutron logging tool.

Lane Wells division of Dresser Industries, Inc., took the wraps off the neutron-generating device—the Accelatron—at the International Petroleum Exposition in Tulsa.

It is now being field tested. Spokesmen said the tests have proved that the tool:

... **Is a source** of high-energy neutrons (14 million electron volts) which can activate oxygen and carbon.

... **Makes measurements** deep in the formation.

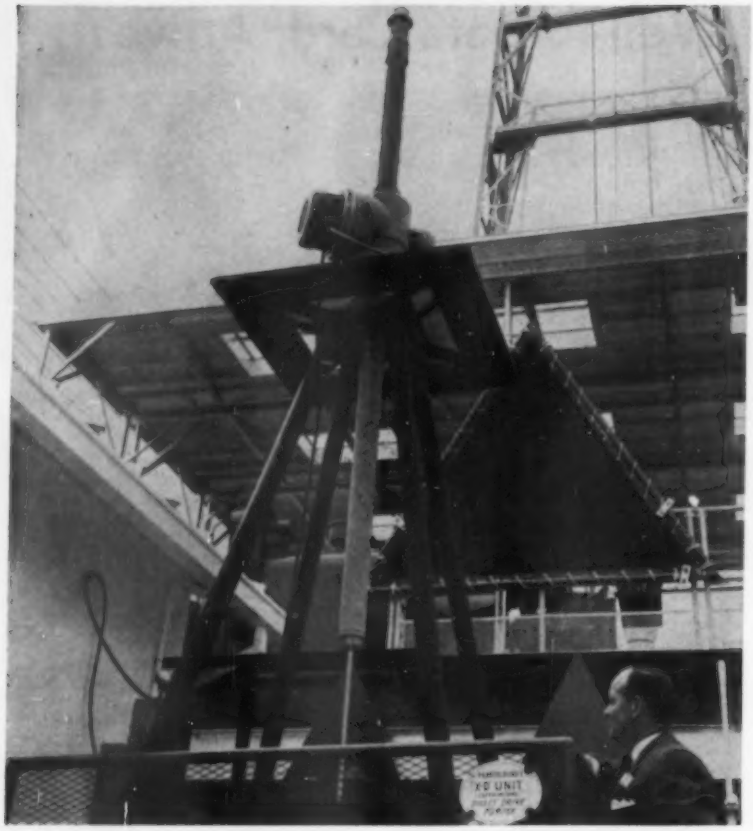
... **Produces** no gamma rays.

How it works ... The generator supplies the high voltage to accelerate the deuterium ions to a high velocity.

These fast-moving ions strike the target hard enough to produce neutrons with an energy of 14 mev. This energy activates oxygen and carbon atoms and makes them radioactive for a short time. This activity is detected by another part of the logging tool, and a record is made at the surface.

Since water contains oxygen, the tool can detect the presence of water, and it can distinguish between water and oil saturation in the reservoir rocks, the company said.

The tool was developed by Well Surveys, Inc., another of the Dresser Industries.



REVOLUTIONARY PUMPER, Parkersburg's experimental X-D unit, boasts claimed efficiency of 94%. Unit shown here, powered by a 5-hp. electric motor, is lifting a 1,700-lb. load at a rate of 8 s.p.m. Capacity is 6,000 lb.

Experimental Pumper

. . . entered second round of field tests in Oklahoma last week, should hit the market in 6 months. New unit applies auto-steering gear principle to get extreme efficiency.

AN ultra-efficient experimental well-pumping unit went on display for the first time during the IPE.

The completely unconventional unit, Parkersburg Rig & Reel Co.'s "X-D" pumper, coincidentally entered its second round of field tests last week. The tests are being conducted in a small Oklahoma oil field just south across the line from Coffeyville, Kans.

Production models will hit the market in about 6 to 8 months.

The new unit's design approach merely applies the auto-steering gear principle to oil-well pumping. By so doing, it achieves an astonishing efficiency claimed at roughly 94%.

Basic components are a ball-nut actuator and a screw shaft. A direct electric drive spins the ball nut which is penetrated vertically by the screw. The lower end of the screw is attached to the rod string.

Rotation of the nut, fixed in place so that no other movement is possible, forces the screw up and down, imparting the pumping motion.

Stroke timing is motor-controlled—the electric motor cutting off at the bottom of the stroke then cutting back in to start the next stroke. A unique feature of the setup is that the pause between strokes can be stretched out almost indefinitely to any desired interval simply by adjusting a small nut at the ground level.

When the motor kicks on to begin a new stroke, it does not start under load but picks up the load softly. This tends to cut down on power consumption.

Length of the stroke can be varied over the full length of the screw shaft.

Its advantages . . . Several strong advantages are claimed by Parkersburg for its X-D model.

They include:

. . . Small operating cost. Its high efficiency makes the X-D a small consumer of power. Parkersburg figures, for instance, that a small unit handling a 2,000-lb. load would consume only 15 to 18 cents worth of power a day at a cost of electricity of ½ cent per kw.-hr.

. . . Flexible stroke timing. The feature permitting a long interval between strokes makes the experimental unit a natural, Parkersburg says, for service in heavy crude areas. The X-D would eliminate "fluid pound," one of the principal pumping problems in such areas by allowing ample time for the cylinder to fill with heavy oil between strokes. It also eliminates the need for time cycle controllers.

. . . Smaller, lighter units. Efficiency, again, permits scaling down weight and size of the pumping unit. An X-D designed to do the same lifting job as a conventional beam-type pumping unit, Parkersburg says, will weigh only one-tenth as much as that beam unit.

. . . Compact construction. Another unusual feature is that the ball nut-screw shaft assembly serves also as stuffing box and flow tee. The screw is packed along its entire length in an inner housing with a new type packing. Well fluid enters the annulus between this inner housing and the outer barrel and is forced out through the lead line.

The cost . . . The cost of the X-D production models will run about the same as that for hydraulic pumps for the same service.

Life expectancy of the screw and screw packing at present, Parkersburg says, is about 5 years. About the only part of the system now requiring maintenance is the seal between the motor and the transmission. The clutch on the X-D is of the dry-fluid type, wherein the "fluid" consists of tiny, almost powdery bead shot. The shot, thrown out by centrifugal motion, operates the mechanism.

The first X-D units offered for sale to producers will be designed solely for shallow service to maximum depths of about 2,000 ft.

Eventually, however, Parkersburg plans to offer huge units with stroke length of up to 40 ft. and lifting capacity as high as 200,000 lb.

Wire-Line Tool Cuts Multiple Completion Costs

THE INDUSTRY'S first wire-line multiple-completion tool made its initial exhibit bow last week.

The tool was developed by Sun Oil Co. and is manufactured and sold by Otis Engineering Corp. under license from Sun. The device does away with the need for multiple strings of tubing in a well. It is able to produce and "prorate" below ground two or more zones in a single tubing string.

This, Otis says, makes it especially attractive for slim-hole completions when used in conjunction with isolation packers.

It is adaptable, Otis says, to any multizone well provided there is some pressure differential between the pays.

A choke bean for each zone controls the flow of production from that zone. And the volume produced is calculated by applying the pressure-differential data. Only after this is production from the zones commingled and produced into common tankage.

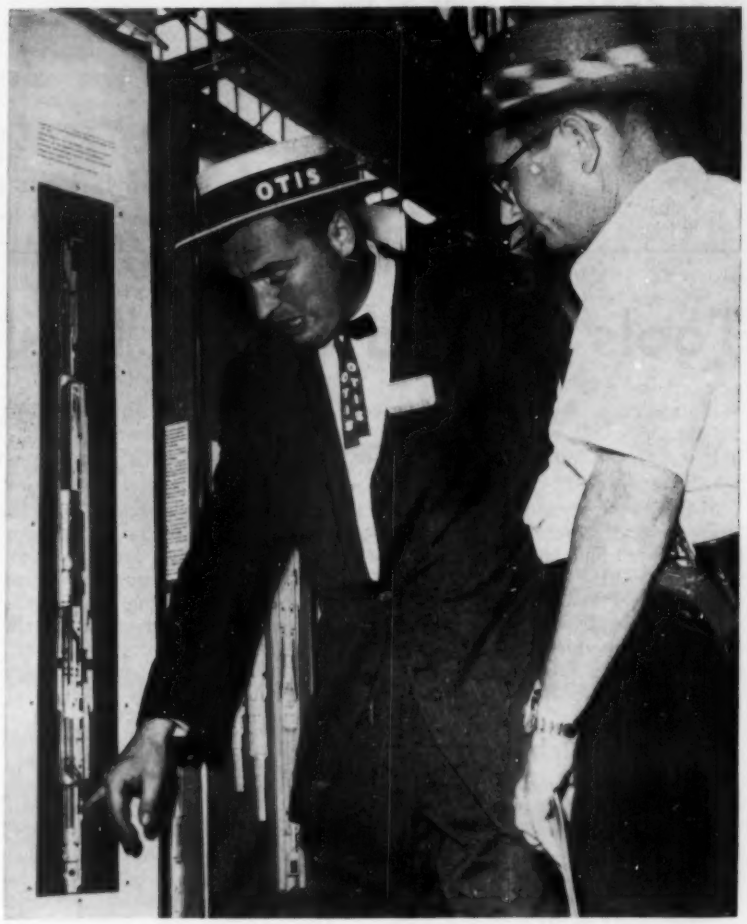
The advantages . . . Along with eliminating multiple tubing strings, the tool also does away with any need for producing a zone through the casing-tubing annulus.

This, of course, cuts heavily into the cost of equipping a multiple completion as is done conventionally. The savings are especially large in tubing and tankage.

Besides the savings in dollars, there are several other advantages.

One is that, due to the pressure difference between zones, some of the energy from a strong pay serves to help produce a weak one. This, Otis says, enables the operator to produce such a weak zone much longer than he could ordinarily afford to do thus serving the cause of conservation.

Still another point in the tool's favor, the company points out, is that proration is controlled below ground, eliminating the possibility of any tampering. If a change in flow volume from any zone is desired, the tool is simply and quickly withdrawn with a wire line and the respective choke bean easily changed to the desired size.



MORE SLIM HOLES may be drilled due to introduction of industry's first wire-line, multiple-completion tool. Tool permits production of two or more zones through one string of tubing.

Giant Beam Unit to Tackle Deep Floods Soon

THE WORLD'S largest beam pumping unit caused a bunch of sore necks last week as IPE gawkers strove to take it all in.

The huge pumper, the first such unit assembled by Lufkin Foundry & Machine Co., is billed as the "Paul Bunyan of the Oil Fields."

Its vital statistics: A maximum 20-ft. stroke, an overall height of roughly 47 ft., a peak torque of 1,824,000 in. lb., and a polished-rod capacity of 62,000 lb.

The big pump, Lufkin's A-1824D-240-62, sells for about $27,000. It is air balanced and offers an optional drive. Though not yet in the field, it now is in production.

A Lufkin spokesman told the Journal that the unit can handle pumping chores at almost any desired depth—could even pump from pays to 20,000 ft. or more if rods were available to stand the strain.

Prime use of the giant unit, however, Lufkin expects, will be for pays shallower than this where extremely large fluid volumes must be moved. This would include waterfloods where great quantities of water are produced with the oil—or in natural-water-drive reservoirs with the same problem.

It would fit in especially well, Lufkin thinks, in very deep water floods and for heavy-duty pumping in heavy-crude pools.

In handling extra large fluid volumes, the company says, the unit likely will be used with big rods, 3-in. or even larger tubing, and with big down-hole pumps.

PIPELINE news at the IPE

- In construction, equipment is heavier, engines more powerful. New twists seen in internal lineup, ditching, coating.
- A new supervisory-control and data-logging system is being introduced.
- Visitors saw some of the biggest meters ever made. Also unveiled were a new mass flowmeter and new designs in valves.

Tools Beefed Up for Big-Inch Jobs

• New equipment for internal lineup, coating, and ditching provides fresh wrinkles to gaining speed and cutting costs in pipeline construction.

BEEFED-UP equipment to handle larger-diameter pipe and several new tools to speed pipe laying were exhibited at the IPE.

Some new twists in pipeline construction were covered in the displays of equipment for internal lineup clamps, coating, ditching, and other phases of pipeline work.

1. More Sideboom Heft

An example of manufacturers' providing machines to do a bigger job is the Caterpillar No. 583 Series 8 Pipelayer, which the company calls the biggest of its type.

This sideboom tractor has become a familiar sight on 30 and 36-in. projects. But this year it's a heftier machine, uprated from 191 flywheel hp. to 225 hp. through turbocharging. Its lifting capacity is up to 137,000 lb. at 4-ft. overhang. Redesigned counterweights permit high ground clearance during extension and improved advantage from each pound of extendable weight.

The new 583 has recently been working on its first job, a section of the Michigan Wisconsin Pipe Line Co. looping in Oklahoma's Laverne field.

The Caterpillar D7 has been turbocharged to increase flywheel horsepower 9% to 140 hp. and drawbar horsepower from 102 to 112 hp. This modified machine with a Rome KG7 blade has proved its ability to cut clearing costs, the company says.

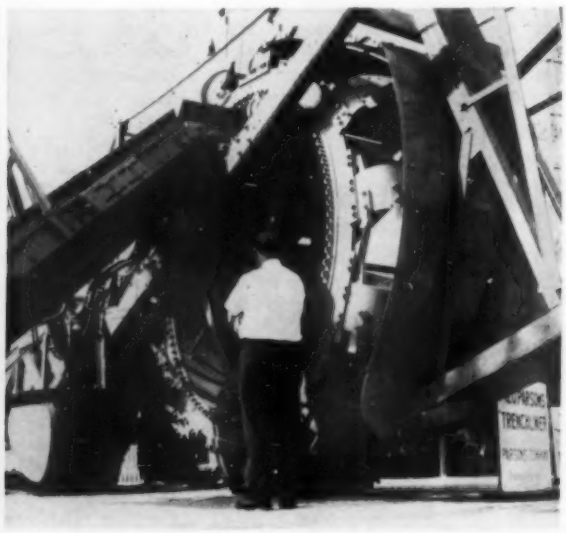
Time to knock down and shear off trees was reduced from 1.71 hours per acre for standard dozers and KG blades to 1.45 hours in recent tests, Caterpillar says. A cost reduction of 41% for knock down, piling, and repiling during burning is claimed for the special blade.

A versatile four-in-one skid shovel mounted on TD-20 tractor was shown by International Harvester Co., along with heavier pipeline-construction equipment. The International Drott shovel offers in one attachment four basic construction units.

A machine-selector lever positions a two-segment bucket four ways. Change from one unit to another requires only 1 or 2 seconds, saving time of changing attachments. In one position, it is a bulldozer, in another, a scraper, a skid-shovel, or a clamshell.

Other exhibitors whose names are

BIG sideboom tractor is tried out . . .



. . . and a pipeliner eyes a giant ditcher.

well known in pipeline construction showed improved lines of equipment with the general theme of increased efficiency, greater capacity, lower operating cost.

2. Ditching by Seismograph

Pipeliners have borrowed a tool from the oil finders to cut ditching costs.

It's the seismograph, which will examine the subsurface to see whether blasting or ripping is in order to make the ditch. Geophysical Specialties Co., Hopkins, Minn., has developed the miniature direct-reading refraction seismograph for this purpose. It will work to depths of 50 ft.

A sledgehammer blow rather than explosives is used to transmit sound waves. The instrument measures the time required for waves to travel from the source to the sound detector.

The tiny seismograph unit is easy to handle out on the job. It weighs only 16 lb. plus the 8-lb. sledgehammer. It is designed with transistors and printed circuitry to achieve compactness.

A time-interval meter is started by the hammer blow. It is stopped when the sound wave reaches the detector. The time interval is read directly on indicator lights on the panel. Two men can operate the unit. The manufacturer says that they need no previous experience with refraction seismology.

The seismograph will provide answers determining ditching methods such as:

... **Depth to bedrock.**

... **Thickness of alluvium,** glacial drift, soil, unconsolidated material, and weathered material.

... **Presence of rock** or solid material at a specified depth.

... **Whether material is solid rock** or alluvium, fresh rock or weathered rock, water-filled gravel or hard clay, solid-foundation materials or loose materials.

Rippers . . . Rippers mounted on the biggest tractors can cut through surprisingly tough rock material down to 6 or 7 feet.

The ripper can shatter any fractured, weathered, or stratified rock at much less expense than drilling and blasting. Such materials as bedrock granite, however, leave no alternative to blasting. But in anything less formidable, the ripper has proved to be a cheaper means of clearing a path for the ditching machine.

Ditchers . . . A number of ditching machines designed for big-inch pipeline were on display.

There were improvements in the Cleveland 320 designed to produce more footage and longer equipment life. Parsons showed its 420 Trenchliner which will dig a trench as deep as 7 ft., 6 in., and in widths of 36, 42, and 48-in., with optional sidecutters 39, 45, and 52-in. It will cut up to 25 ft. per minute.

GarWood-Buckeye introduced its Model 318 Pipeliner with "Torqmatic Converter Drive." It permits the operator to vary speed in any gear range by about 40% without losing horsepower and without stopping to shift. The engine-converter combination matches torque and speed to the load.

Cranes . . . Insley Manufacturing Corp. showed three new model excavator cranes, representing progress of this company and others in the field.

The Type M with trench hoe attachment is mounted on 12-ft., 6-in. crawlers with 30-in. shoes. Type WT with trench hoe attachment is mounted on 14-ft. crawlers with 30-in. shoes. A new 45-ton truck crane with 60-ft. boom has a combination floating and folding boom gantry, and hydraulic counterweight removal.

3. Coating Problem Solved

An ingenious coating machine uses centrifugal force to solve the heretofore baffling problem of applying epoxy coatings to the outside of the pipe.

The machine, which overcomes the trouble from short pot life with a catalytic setting coating, was demonstrated by M. J. Crose Manufacturing Co.

Once coating material and catalyst are mixed before application, they begin to harden, like cement. Delay may mean the mixture will set up.

The new machine gets around the short pot life. The active and reactive material is kept in separate containers and fed to the surface of a small rotating drum.

The materials are fed to a larger rotating drum covered by a wire and partially enclosed in a housing. The coating, now mixed thoroughly during rotation, is thrown by centrifugal force in a fine spray against the revolving pipe. Centrifugal force and brush action instantly cleans the drum.

Pipe is cleaned beforehand by grit blasting. After coating, it is cured in an oven for several minutes. The epoxy coal tar used in the demonstration was baked for 15 minutes.

Development of this plant coating

NEW COATING technique is displayed . . .

. . . and internal lineup clamp is explained.

machine may permit increased application of thin-film coatings with thin-wall pipe.

Applied at a yard or mill, the unusually tough coating will survive rough handling in transit and during laying.

Internal coating of small-diameter pipe also was demonstrated.

Pittsburgh Coke & Chemical Co.'s Tarset, a catalytic-setting coal tar epoxy, was applied with equipment developed and operated by Associated Protective Coating, Inc.

No thinner was used in applying coating of 20-mil thickness. Resin and catalyst were mixed in a spinning head, rotating at 3,600 r.p.m., and fed by two interlocked pumps operating at 160 psi. Resin moved to the head through two tubes. Catalyst moved through one tube.

At ambient temperature the coating set up in 8 hours on the days of the demonstration. At 120° F., the coating would set up in 3 hours.

After the coating operation, the mixing head and tubes were cleaned out with Pittchem thinner as the solvent.

4. Faster Lineup Clamp

A new air-over-hydraulic clamp designed for speed, good line-up, and economy drew wide attention at the IPE.

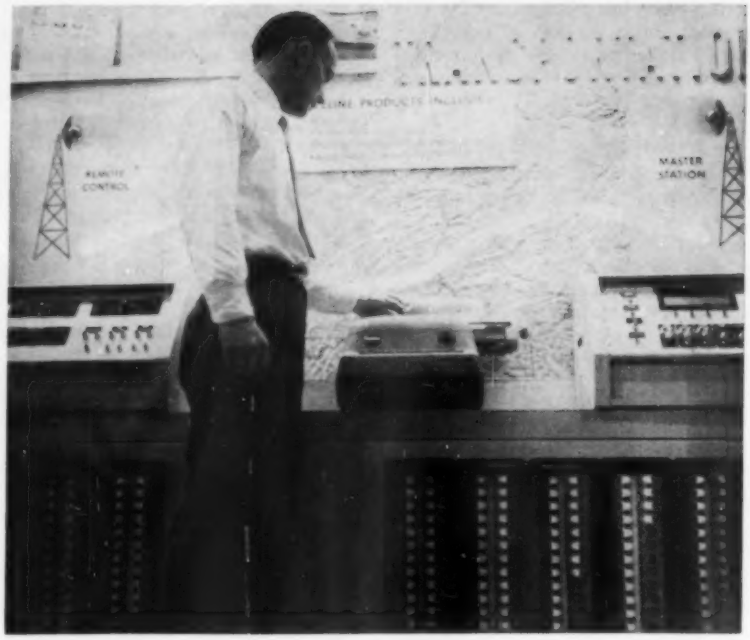
The clamp was developed by Crose Manufacturing. The first model was for 24-in. pipe, but clamps for larger diameters are available. They can be made as small as 16-in., compared with the normal 20-in. minimum for power clamps.

The clamp will rent for 1 cent a foot. This is double the rental for mechanical clamps but cheaper than some power clamps. Crose said it would be used on some major projects this summer.

The clamp is powered by a compressed-air tank which operates at 80 psi. The shoes which push against the pipe wall exert a force of 40,000 psi. Line-up is achieved within 2 seconds after power is applied. The clamp reduces the need to hammer out-of-round pipe.

The advantage of this clamp, like other power clamps, is its ability to line up pipe rapidly and uniformly all day long.

Excellent line-up can be made with mechanical clamps which are widely used. But the output of a mechanical clamp is reduced when the operator turning the crank grows tired. The power clamp applies the same pressure at the end of the day as at the beginning.



Rise in Automatic Controls

. . . for pipeline use apparent by displays at IPE. Several supervisory systems are now available to pipeliners.

A NEW supervisory-control and data-logging system has been announced by General Electric Co.

On display at the IPE, the supervisory equipment has a space-code-selector system with automatic check-back for maximum security. It provides for control and telemetering for pipeline pumping stations over a single pair of wires or communications channel. It also has applications in production and refining.

A data-logging system called APRIL, for automatically programed remote-indication logging system, uses an electric typewriter to print digital data received from remote units.

Several other supervisory systems were on display, reflecting the rapid rise of automation, first on liquid lines and more recently on gas lines. Southwestern Industrial Electronics showed a supervisory system now operating on the Cherokee Pipe Line. Union Switch & Signal was among the exhibitors also offering new control units.

Improved Valves Offered Pipelines

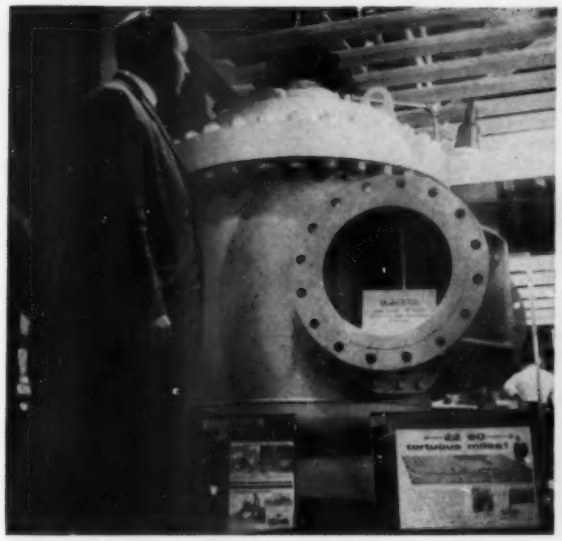
DESIGN improvements in large pipeline valves have been made by several manufacturers.

The first high-pressure gate valve with full 36-in. diameter for gas lines of this size was exhibited at the IPE by Grove Valve & Regulator Co. Grove says this will be the first to permit unrestricted flow at pressures up to 960 psi. The valve rises to 18 ft. and weighs 13 tons.

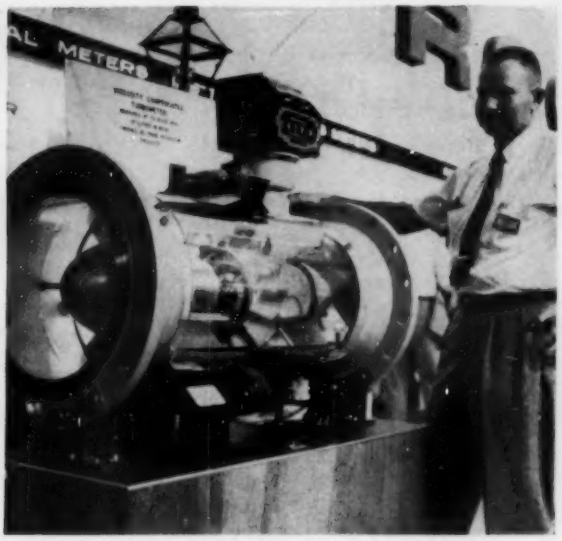
W-K-M showed its new pressure-sealing gate valve available in ASA 150 and ASA 300-lb. class and sizes from 2 to 12-in. It provides a tight seal both upstream and downstream and requires no lubrication. It is a full-bore, through-conduit valve with seats that automatically adjust for wear. There is automatic upstream relief for excessive body pressure.

Full-opening, spherical-type valves have been developed by Rockwell Manufacturing Co. The Hypresphere valves are available for the largest diameters. They are adaptable to all types of power operation, provide for two-way flow, open or close with a quarter turn, and positive shutoff.

The valve has only four main parts —the operating stem, ball plug, two spherical ring seats, and the body housing. Only the operating stem and ball plug are moving parts.



WORLD'S LARGEST p.d. meter of its type.



TURBINE METER with gigantic capacity.

Meters Growing King-Sized to Meet Demand

- Pipeliners visiting IPE see some of the biggest meters made. New mass flowmeter for direct measurement of gas and liquids is also unveiled.

THE DEMAND for giant meters —and developments to meet the demand—were pointed up particularly by two IPE exhibits.

The two new meters for liquid measurement were of different types:

. . . A turbine meter with capacity of 15,000 b.p.h., manufactured by Rockwell Manufacturing Co.

. . . A positive-displacement meter, the largest of its type in the world with capacity of 12,500 b.p.h., manufactured by A. O. Smith.

The turbine meter provides for sustained accuracy regardless of viscosity of the product. This viscosity compensator is unique. The meter, in tests by Rockwell and in pipeline test loops, has proved to have high accuracy and repeatability. It also has low initial cost, head loss, and maintenance.

The 16-in. p.d. meter is being used on big crude lines in the Middle East and Venezuela. Some 25 are in use, Smith said, and 10 more were sold during the first half of the IPE. This basic type of meter has proved its accuracy over many years of service.

New mass flowmeter . . . Development of a mass flowmeter which will directly measure gas and liquid flow in pounds was announced by Black, Sivalls & Bryson and General Electric Co.

Marketing in the petroleum industry will be handled by BS&B with first units expected to be available early next year.

Its developers claim the instrument's margin of error is less than 1%. Accuracy is said to be sustained over wide ranges of flow rate, pressure, temperature, and density without additional measurements and corrections for these variables.

Use of the new instrument will cut costs of computing operations required in measurement by volume. A broad range of application is forecast in the gas industry from the wellhead to distribution systems.

A prover facility for calibration of the flowmeter has been placed in operation in BS&B's Oklahoma City laboratory.

The flowmeter can be designed into remote-controlled systems. Electrical pulses, each representing a given weight of flow, will operate remote recording, dispatching, and accounting systems.

The flow-rate sensor in the new meter has been used for 6 years for measuring aircraft-fuel consumption. It consists of a constant-speed impeller and a stationary turbine arranged for axial flow.

The impeller gives a twist to the fluid stream and the fixed turbine straightens the stream. The torque exerted on the turbine is proportional to the mass rate of flow. A small gyroscope automatically totalizes flow by integrating the torque with respect to time, permitting the output to be continuously summed up on a dial reading in pounds. The flowmeter was shown at the International Petroleum Exposition last week.

Big Pipeline Buys Gas Turbine Engine for Standby Power

THE GAS turbine, which has made a big impact as a driver for centrifugal compressors, has cracked a new field in pipelining.

The new application is for standby power at a compressor station on a natural-gas transmission line.

Solar Aircraft Co. announced it has sold the first unit for this purpose to a large transmission company. It was a 300-kw. generator set.

It is suited to this service because starting is instant and reliable and the generator can handle a full load immediately. This is important for emergency power supply. The engine needs no warmup. It will assume a full load in 10 seconds on air start and in 30 seconds on electrical starting.

REFINING at the IPE

- Practice panel trains cat-cracker operators, lets old hands prepare for emergencies without danger.
- New continuous end point analyzer given its first showing for refiners.
- Simple, low-cost method to control internal reflux flow in a fractionating column demonstrated.

Fledgling Refiners Now Can Practice

REFINERS visiting the Hall of Science shared an interest with the general public in a new concept in operator training.

The public viewed it as a faithful full-size duplication of a control panel and console of a large fluid catalytic cracking unit.

But refiners recognized it as something much more than that. It is the first training device of its kind in refining. Built by Carmody Corp. of Buffalo, it has been in use for several months to train Sohio operators now working on the company's new 30,000-bbl. fluid unit at Toledo.

The panel is an inexpensive simulation of the real thing at Toledo. But for training purposes it provides the necessary practice in controlling process variables under normal operating conditions. It also permits introduction of upset conditions.

On the panel are 24 activated instrument representations, three interlock systems, and four alarm systems.

The first Carmody trainers, for the chemical industry, used actual instruments. But this was found to be unnecessary, and photographs of instrument faces were substituted, together with activated pens and pressure sensitive colored tape to produce chart lines.

The cost was greatly reduced and the training panel was made more flexible by allowing for modification.

PRACTICE console for operating a cat cracker.

What's involved . . . The "instruments" can be controlled electronically on the panel or remotely from the instructor's console.

A realistic alarm system has been designed for both high and low conditions. A white light indicates a normal process. A red flashing light with an audible signal warns of adnormal conditions, and a steady red light indicates an abnormal process which has been noted but not corrected.

The interlock system allows the instructor to make different instruments respond automatically to key instruments at the console. It is possible for Carmody to simulate the entire cat cracking process automatically. But in the interest of economy, Sohio specified only those interlocks which its training personnel needed.

One of the interlock systems simulates process conditions resulting from variable feed flow to the reactor. When the instructor increases the flow, the feed control recorder rises at the proper rate. The reactor temperature recorder responds, and the reactor and regenerator slide valves open.

The trainer also has an interlock system for the emergency cutoff valve. When that switch is thrown, cutting all feed to the reactor, seven instruments on the panel are activated by the instructor, showing the results.

Big asset . . . The trainer was delivered to Toledo 3 months before the plant's cat unit was put on stream.

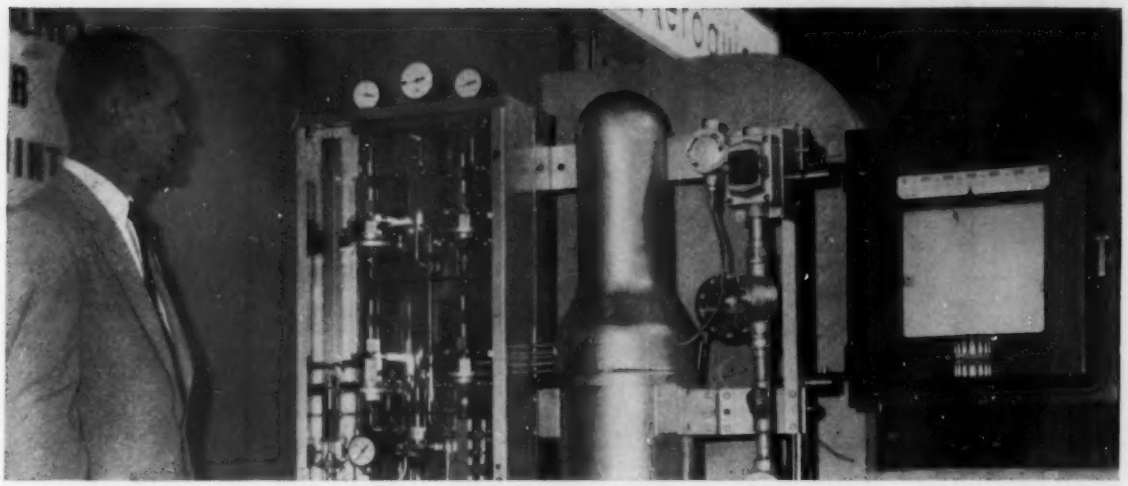
Sohio representatives say that it enabled them to increase training effectiveness from 3 to 10 times.

When the oil show is over, the unit will be returned to the refinery, where it will continue to be used in training new operators.

The unit has still another use. It gives management an opportunity to evaluate trainees before they are trusted with the unit proper. It also permits experienced operators and technicians to review their proficiency periodically, as a means for upgrading in their assigned jobs.

One further use Sohio has found valuable is to evaluate its training program. Good results on the training panel indicate that the program is succeeding with prospective operators.

The Sohio panel cost $35,000. The cost varies, depending on how many interlock and alarm systems are desired.



New Continuous End Point Analyzer Shown

MANY refiners visiting the Exposition got their first look at a new continuous end point analyzer (above).

Displayed by Technical Oil Tool Corp. of Los Angeles, the unit is identical to several now in use in California and Pennsylvania refineries.

This instrument will record either Engler end points or 90% points falling between 200° and 600° F. (OGJ, Apr. 27, p. 91). It does so with a minimum of time lag, giving the operator a reading in product quality and permitting him to keep his unit production more closely on specification.

The units now in use are serving as recorders only. But the end point analyzer promises one more step. The loop can be closed by feeding the analyzer signal into a process controller.

This step is now being investigated. One of the Totco analyzers is installed on the reflux line of a distillation column in an undisclosed U. S. refinery.

Among other systems, it may be combined with a Moore Nulmatic temperature transmitter to feed a signal into a controller to incorporate the analyzer in a full control system on the distillation unit.

Reflux-Flow Controller Simple, Low Cost

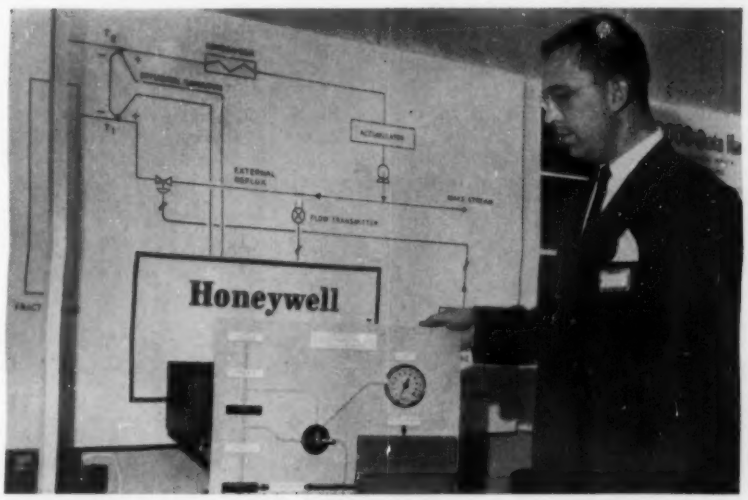
A SIMPLIFIED, low-cost method for controlling internal reflux flow in a fractionating column was demonstrated by Brown Instruments Division, Minneapolis-Honeywell Regulator Co. (right).

It uses standard industrial electrical and pneumatic instrument components to vary the external reflux flow rate as required for holding a constant internal reflux.

How it works . . . Measurements are made of external reflux flow and the temperature differential between the tower top and the external reflux.

These measurements are fed into the simple pneumatic analog computer, which proceeds to make a heat-balance calculation to give, indirectly, a precise measurement of internal reflux flow.

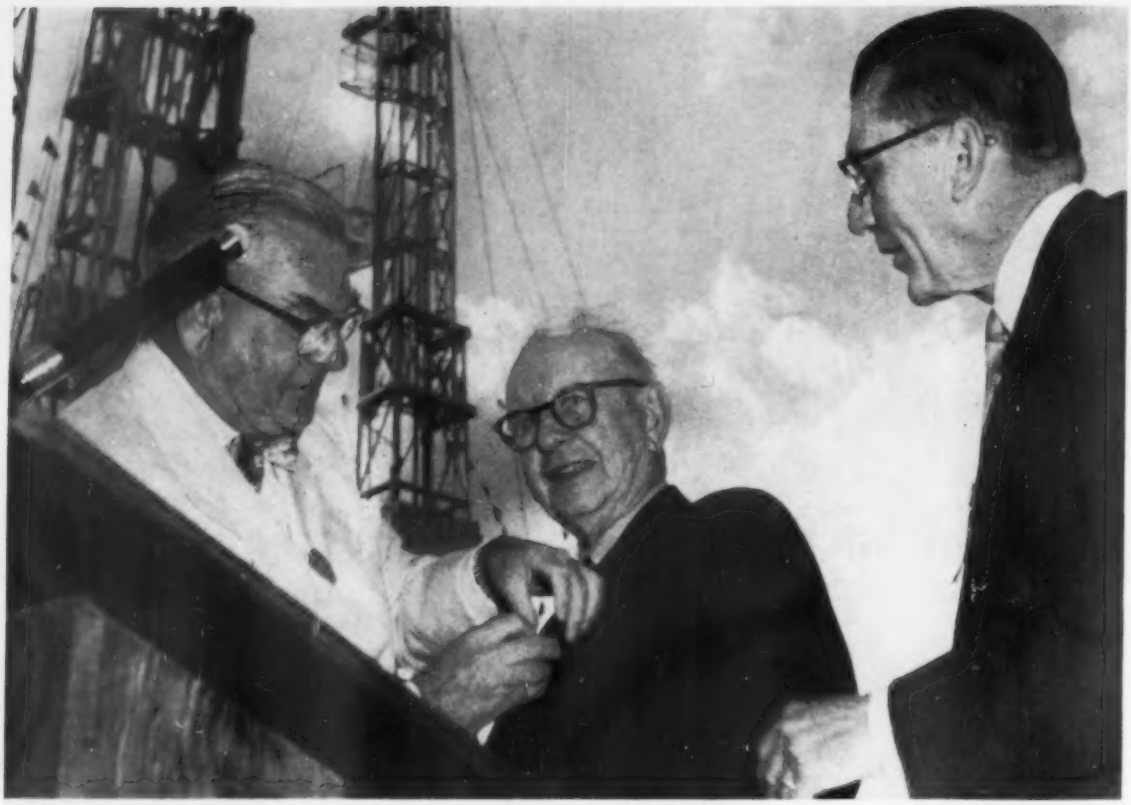
Three control-computer components are involved. An adjustable-range MV/P (millivolt to pressure transmitter) converts the millivolt output of the temperature-measuring thermocouples to a pneumatic signal.



A Sorteberg Type S force bridge, which is a square root extractor, produces a 3 to 15-psig. signal proportional to external reflux flow.

A Sorteberg Type M force bridge which is a multiplier, takes the signals from the first two components and produces an output of 3 to 15 psig., which is proportional to the internal reflux flow.

The internal reflux controller will "see" this value and hold it constant by varying the external reflux flow. The index of the internal reflux controller can be set by cascade or ratio arrangement from other controllers.



PIONEER of Pioneers Billy Connelly gets award from IPE President W. K. Warren as Master of Ceremonies P. C. Lauinger looks on.

Industry's Grand Old Men Win Hearts

THE OLD TIMERS of the petroleum industry still pack a punch.

Eight oil pioneers received special citations and the plaudits of hundreds in impressive ceremonies at the International Petroleum Exposition.

A crisp recitation of high points in the careers of these deans of industry was made by P. C. Lauinger, publisher of The Oil and Gas Journal.

To accompaniment of cheering crowds, the awards were pinned on each of the veterans by W. K. Warren, IPE president. Those honored were:

William L. (Billy) Connelly, 86, Tulsa, "Pioneer of Pioneers."

Wiley B. Hissom, 66, Tulsa, "Grand Old Man of Drilling."

Edmond C. Breene, 81, Oil City, Pa., "Grand Old Man of Production."

S. Miller Williams, 72, Robinson, Ill., "Grand Old Man of Pipeline and Transportation."

Frank J. Hinderliter, 84, Tulsa, "Grand Old Man of Supplies and Equipment."

Frank H. Lerch, Jr., 71, New York, "Grand Old Man of Natural Gas."

Edward I. Hanlon, 78, Tulsa, "Grand Old Man of Natural Gasoline."

William A. Cassidy, 93, Bayonne, N. J., "Grand Old Man of Refining."

In Hanlon's absence, his business associate of 35 years, Jack H. Boyle, accepted the award. Cassidy's award was accepted by his son, William A. Cassidy, Jr., of Bayonne, who 3 years ago retired from Jersey Standard's Bayonne refinery, exactly 30 years after his father had retired in 1926.

Selection of the old timers followed world-wide screening by the IPE's Old Timers Committee headed by W. J. Sherry, Tulsa independent.

Staunch theme of the pioneers' hard-core philosophy for keeping today's oil business on an even keel was packaged in impressive fashion by Breene. He said:

"As a class, oil men have been courageous, optimistic, energetic and persevering.

"They have always been willing to risk a last good dollar on a wildcat well. The oil man has been honorable in his dealings.

"Thousands of wells have been drilled with word of mouth the only contract. There has been little trouble. Oil men who have built the industry are rugged individualists. They had to be to survive.

"Just because a few senators who may be lacking in qualities of statesmanship attack the industry to call public attention to themselves, I trust companies and individuals will not be slow to make reply.

"I hope they will not stand by and not resist these accusations. The domestic industry thus can be maintained in a strong and a healthy condition."

One by one, Lauinger dipped into the fabulous careers of the venerable gentlemen for the oil show crowd.

He said:

. . . Of Connelly: "Sixty-eight of his 86 years have been spent actively in the oil business.

"He was a leasehound in Ohio, operated an oil equipment repair shop, drilled his first well 64 years ago in Wood County, Ohio. He had the luck of the Irish—his first well was a producer at 100 bbl. a day.

E. C. Breene
Production

F. J. Hinderliter
Supply-Equipment

W. B. Hissom
Drilling

S. M. Williams
Pipelining

F. H. Lerch, Jr.
Natural Gas

# of IPE Throng

"Itching feet took him to Independence, Kans., he teamed with Harry Sinclair and formed an association with Sinclair interests that lasts to this day."

... Of Hissom: "He went from construction-gang water boy to blacksmith to qualified driller at 23 years.

"He achieved many notable feats in drilling, including the first well ever redrilled with a rotary outfit. He recalls when men on the rig were too busy working a 12-hour tour to have any time to argue about theories or to gripe about conditions—and when drilling contracts were awarded on basis of a driller's skill and experience instead of on sealed bids."

... Of Breene: "He started as a tool dresser in Pennsylvania fields in 1896. He has pursued two careers, oil and law, since the turn of the century.

"The only thing that could detract from his renown in the oil industry is his own equally distinguished reputation in the field of law. His legacy to petroleum is unique. Each of his five sons is actively engaged in the industry today."

... Of Hinderliter: "He entered the oil business at the age of 12, as a pumper for his inventor-father in Pennsylvania.

"He inherited his father's inventive genius and has patented 99 inventions, chiefly in the field of fishing tools and devices for down-hole operations. He is one of the organizers of the IPE and has been a vice president of it since 1923."

... Of Williams: "Miller Williams was the strategist, the visionary. He could see farther down the road than almost any of his contemporaries.

"The Williams Brothers company has laid pipe over every mountain range in the United States and has spanned every principal river except the Hudson, from the Rio Grande to the St. Lawrence.

"Williams' crews have struck through jungles of Panama and Africa, the mountains of Mexico and Bolivia, the turbulent shallows of the Coro Gulf in Venezuela. Miller Williams has been vigorously instrumental in advancement and application of pipeline technology."

... Of Lerch: "He has taken an active part in development of the gas business for exactly half of the oil industry's first century. He received his chemistry degree in 1909 when men with scientific or technical degrees were rare in the oil and gas business. He has never lost this scientific and technical interest in natural gas."

... Of Hanlon: "He was a young bookkeeper in the West Virginia oil boom. Ed chauffered the famous 'iron barrels' by oxen through mountains to an Ohio river landing.

"The first of many companies to bear his name was formed at Sistersville early in the century to manufacture and market casinghead gasoline. He moved to Tulsa in 1917. Soon, the company he headed became one of the largest independent producers and distributors of natural gasoline."

... Of Cassidy: "This Englishman has lived most of his life in Bayonne, N. J., which became his home more than 90 years ago when he arrived in this country.

"He took a prominent part in the progressive labor program which Standard Oil Co. (N. J.) instituted in 1918 and from which the company adopted collective bargaining, the 8-hour day, and regular conferences between labor and management.

"His knowledge of and contributions to the field of lubes and waxes in particular are unmatched."

Safety First

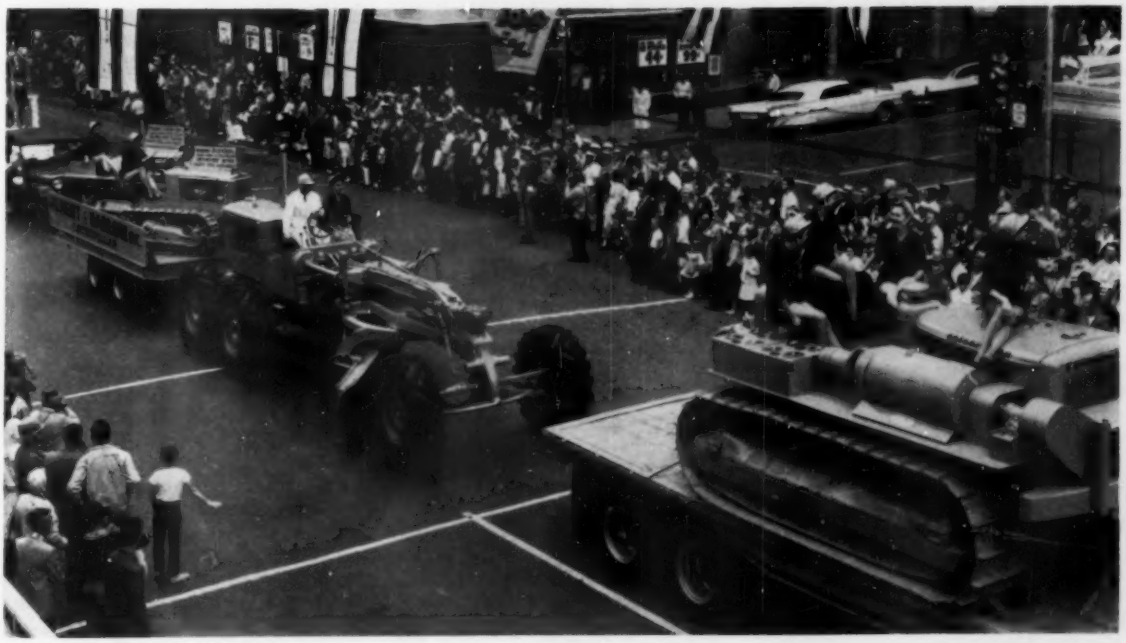
There were 84,000 people swarming over the show grounds on Sunday, and the chances of separated families were excellent. No risks were taken with this youngster, who came prepared for the obvious emergency. It was strictly a precaution. He didn't get lost. At least, he didn't show up at The Oil and Gas Journal Building.

Man, I'm Tired!

. . . is the reaction of Blondie, 9-year-old lioness after she toured the IPE grounds. Her owner, Charles Hipp, drilling contractor from Graham, Tex., who has raised Blondie from a cub, brought her to the show and made the Bucyrus-Erie booth his unofficial headquarters. Blondie even went night clubbing with Hipp until 4 a.m. once during their stay. Her reaction to walking the show grounds was the same as that of the thousands of IPE visitors. Shown with Blondie are Bucyrus-Erie sales executives G. D. Gayer, H. M. Jameson, and S. A. Stone.

Work Before Business

Myron Kinley barely got to the show before a major company called him to Odessa, Tex., to tame a wild well. Passersby thought the "Off to a Blowout" sign was just Kinley's way of saying he'd gone to lunch. But within 48 hours another sign appeared. Petroleos Mexicanos had a plane waiting for him at the Tulsa airport when he headed back to the oil show from Odessa. The problem: A wild well in Mexico. Myron's show business was handled by his son, Jack, shown here visiting with a Tulsa friend of the family.



Oil Tools on Parade

Early show for the curious public was this parade through downtown Tulsa. It featured the heavy but mobile equipment used in the oil industry. Shopping centers put up rigs or other displays to help advertise the exposition and, at the same time, celebrate oil's 100th anniversary.

Showdown on Depletion Is Delayed

• Senate foes pass up a chance to start depletion fight by failing to tack depletion-cutting amendments on insurance-tax bill. But a battle later on looms with introduction of bill for graduated cut.

ANTI-DEPLETION senators passed up a chance to force the issue to a vote last week, but girded for a fight later on by introducing a bill to provide a graduated cut in the 27½% oil and gas depletion allowance.

Depletion foes failed to cash in on the first opportunity of the current session for a showdown by permitting a House insurance-tax bill to sail through the Senate without any depletion-cutting amendments.

But, in preparation for a future fight, Sen. Paul H. Douglas (D-Ill.) tossed a bill into the hopper for a graduated reduction in depletion similar to last year's so-called Proxmire amendment. It would cost producers about $320 million a year.

It heralds a battle which could come later in the session or might be held over until next year.

The Douglas bill was being held off the calendar to permit other members to join as co-authors. So far, the measure reportedly has 10 co-authors.

The missed opportunity came when the Senate was considering a House bill to change the tax formula for life insurance. It was the first such bill to reach the Senate floor this year.

Sen. William Proxmire (D-Wis.) let it be known in advance that he was considering the introduction of a depletion-cutting amendment. He decided against it, partly to prevent jeopardizing the insurance bill, and the measure was quickly passed on voice vote after relatively minor changes.

The junior senator from Wisconsin said he and other proponents of what he called "loophole-plugging" amendments decided to withhold them for the time being because they felt the insurance bill was "most urgently needed" by the federal Government.

Past efforts . . . In the last session of congress, Proxmire introduced an amendment for a graduated reduction in the depletion allowance.

The amendment, voted down 58-31, would have retained the present 27½% rate for producers with gross income up to $1 million but would have cut it to 21% for producers grossing from $1 million to $5 million and to 15% for those grossing more than $5 million.

Sen. John J. Williams (R-Del.), whose proposal for a flat reduction to 15% also was voted down last session, joined Proxmire last week in urging broad tax reforms.

He said he had prepared some

FPC Staff About-Faces

. . . in challenging Transwestern's reserves, the company charges. Testimony of previous hearing cited as proof.

THE FEDERAL Power Commission staff has reversed its earlier stand in challenging the adequacy of Transwestern Pipeline Co.'s gas reserves.

In a brief filed with the FPC last week, Transwestern pointed out that staff counsel David S. Lichtenstein previously had conceded that the company had sufficient reserves to support its proposed pipeline from Texas to California.

The brief was in reply to a staff recommendation against approval of the proposed $189,798,000 project. In urging denial of an FPC certificate to Transwestern, the staff attorney argued that the company's gas supply was not shown to be "reasonably adequate to support the project." (OGJ, May 18, p. 163.)

Objection to a certificate on such grounds, Transwestern replied, "is so stunning as to be incomprehensible."

Earlier testimony . . . Transwestern drew on testimony from an earlier FPC hearing to point out the staff's about-face on the question of reserves. It quoted as follows from a Dec. 16, 1958, transcript:

Gene M. Woodfin, Transwestern attorney: "Now as far as I know there is no question in this record but what on the proven reserves shown by exhibit 14 that we are perfectly confident and able to sell and deliver 300 million feet a day to—"

Lichenstein: "No one challenges that. For the sixth time on this record, for the tenth time, for the fifteenth time, I repeat we do not challenge that. I hope you will rest satisfied with that statement.

"We are addressing ourselves now to an entirely different problem. No one is challenging whether or not you have enough reserves to deliver 300 million to California. We can take that as axiomatic."

Had it been informed that there was any question about its reserves, Transwestern contended that it could have consolidated with the case applications of other producers to sell gas to the company. Additional producer applications to supply Transwestern are on file.

The pipeline company "presented its reserve and deliverability report on only a portion of the gas which it has under contract."

In addition to the 16 contracts mentioned in its original brief, Transwestern stated, other applications to sell gas to it have been filed by six producers. Transwestern based its original application only on gas committed to its proposed line up to a cut-off date, but negotiations for more gas continued.

Cites prices . . . Transwestern also challenged other staff objections, including the charge that proposed rates

amendments, "particularly one dealing with the depletion allowance," but he added that the insurance bill was not deemed the proper vehicle for their incorporation.

"There will be an opportunity later in this session to offer such amendments," Williams said.

No hurry . . . Despite their aggressive tone, anti-depletion leaders made it clear that they're in no particular hurry for a showdown. Since tax measures must originate in the lower house, there are few opportunities to force a depletion vote in the Senate.

The next chance may come sometime in June, when a bill to extend corporation taxes is expected to reach the senate floor.

A depletion rider's chances for success are considered slim this year, especially if it comes late in the session when Congress is in a hurry to go home. But any gains over last year's vote would represent a psychological victory for the anti-depletion bloc.

Any real threat to depletion this session is further reduced by the steadfast opposition of Rep. Wilbur D. Mills (D-Ark.) to "overnight" changes in the tax laws.

The Arkansas Democrat has scheduled extensive hearings by his House ways and means committee, starting next November. The hearings will be aimed at "constructive reform" of the federal tax system.

---

to producers "are at such levels as to be contrary to the public interest."

The company argued that the producer's legal right to fix the initial rate, subject to review by the commission, "must stand unchallenged" until evidence is introduced to enable the commission to determine that such rates are not just and reasonable.

The company contended that it has prevented spiraling of prices in Anadarko basin by placing under contract all available oil and gas leases which its suppliers have in the area. Contracts set a flat price for 10 years. That price, Transwestern pointed out, has stimulated drilling and development in the area.

In the opinion of Transwestern, evidence submitted by the staff "would afford no proper basis" for determining whether a producer's rate is just and reasonable.

In a supporting brief, Gulf Oil Corp. charged that the staff objection on the basis of gas supply is "so contrary to the evidence" that extensive debate of the issue would merely "waste" the examiner's time.

ADDRESSING Harvard Club of Tulsa is W. Harold Rea, president of Canadian Oil Companies, Ltd. C. O. Tongberg, Harvard club president, is at right.

Canada Wants Its Fair Markets

. . . for oil, executive warns. He praises recent exemption but says Canadians still smart from import-control snub.

OIL INDUSTRIES in Canada and the U.S. should be allowed to enjoy an unrestricted movement of oil and products between the two nations both for military and economic reasons.

Terms on which the oil industries and both nations can prosper were detailed last week by W. Harold Rea, Toronto, president of Canadian Oil Companies, Ltd. He spoke to members of the Harvard Club of Tulsa.

Rea praised recent exemption of Canadian crude from U.S. import controls but commented:

"The big question still remains: How much oil is likely to move, now that statutory blocks have been removed?

"The answer is squarely on the doorstep of the major U.S. companies who must have oil for their refineries.

Freedom . . . Rea gave the Canadian viewpoint on the issue. He declared:

. . . The oil industry in Canada doesn't want dominion governmental interference in its business.

. . . Artificial barriers will rise against U.S. and other foreign oil in Canada if logical U.S. markets are not developed for Canadian oil.

. . . About 74% of Canada's oil and gas industry is controlled from U.S. sources.

. . . Canada is the U.S.'s largest customer, importing 26% of this country's total exports.

. . . The No. 1 problem in Canada is a major market for her crude oil.

. . . Gas and oil should be treated as strategic commodities, particularly for defense.

Speaking of the import order, which Rea said "struck a serious blow to the only remaining free-enterprise country in the oil industry today," he explained it placed Canada in the same class as the Middle East or South America.

Equal treatment . . . Land acquisitions in Canada now are at an all-time high, he said.

"Any action that makes either of our countries more dependent on supply from remote and politically unstable areas is a blow to the continued prosperity and well being of both countries.

"Major U.S. refiners have come to Canada in search for oil. They cannot expect to tie up great tracts of exploratory land in Canada and put these reserves in 'moth balls' while at the same time Eastern Canada is importing large quantities of foreign-produced oil."

Rea said that if Canadian markets are not developed in this country, Canada will be forced to take steps to solve her own marketing problems. Only as a last resort, he admitted, would Canadian oil people want to build a huge pipeline to flow oil to big consumption areas such as Montreal and Quebec.

Pipeliners' Panel

R. H. Clute, Chief Engineer
Interprovincial Pipe Line Co.

C. V. Baxter, Vice President and Manager
Salt Lake Pipe Line Co.

G. G. Hughes, Jr., Chief Engineer
Interstate Oil Pipe Line Co.

D. A. Roach, Vice President
Phillips Pipe Line Co. (moderator)

C. D. Faires, Chief Engineer
Shell Oil Co. Pipeline Department

W. B. Knupp, Chief Engineer
Standard of California Pipeline Dept.

C. D. Batchelder, Chief Engineer
Portland Pipe Line Co.

Latest Trends in Pipelining Outlined

TRENDS in metering, interface detection, and prime movers drew top interest in questions put to an expert panel at the API Division of Transportation in Pittsburgh.

Engineers, operating personnel, and executives also were occupied with the practical problems of maintenance, storage, coatings, and right of way. With the need to transport heavy oils becoming greater, there was particular interest, too, in heated pipelines. Fire prevention was an important problem because of the growing practice of unattended station operation.

An examination of the many problems resulted in some major conclusions and disclosed these trends in industry practices:

... **First reports** on new turbine meters are good. And emphasis is being placed on new calibration methods for all meters.

... **Interface detection** is still considered in the development stage, although automatic switching of batches into terminals is being done on a small scale by a products pipeline.

... **Gas-turbine experience** on oil lines, although limited, has been promising, and this driver is being considered for some future projects.

... **High-strength,** thin-wall pipe continues to hold attention as a means of gaining greater capacity per ton of steel to hold the line on costs.

... **New tank designs** may offer a chance to reduce inventories by cutting down the working level of storage.

... **Contracting of maintenance** has proved profitable and is likely to become practiced more widely.

... **Heating is economical** for very heavy oils, but not for lighter oils.

... **Fire-protection systems** are the exception at pump stations, but are being installed at some remotely operated stations.

Metering... The advantages of the turbine meter were outlined by various pipeliners whose companies have had experience with them the past 2 years.

They were reported to be cheaper —half the cost of positive-displacement meters of the same capacity— as well as being very accurate.

Interstate Oil Pipe Line Co. has tested the meters of three manufacturers. All were found to have good reproducibility. The accuracy curve has a steeper slope than with p.d. meters, particularly as viscosity increased. But it's possible the design of the test loop may have been at fault.

Sun Pipe Line Co. has had two 6-in. turbine meters in custody-transfer service on its products system for 2 years. The difference between ingoing volume and outgoing volume measured by the turbine meters was less than .01%, with throughput of 50,000,000 bbl. Maintenance was reported as zero.

No crude-oil custody transfers are being made with turbine meters, but several are being installed on crude lines to check against p.d. meters.

The most satisfactory and economical calibration system for large-capacity meters in the 10,000-b.p.h. range was discussed at length. Interstate reported experience with the double-weir prover tank and bank of master meters. The measured pipe was considered to have good possibilities, being cheaper, adaptable to automation, speed, and more frequent calibration.

Shell Oil Co. mentioned the measured-distance pipe and expendable slug, both using sections of pipe, as good alternate methods. The "measured mile" has been used for years.

Texas Pipe Line is perfecting the expendable-slug system, using 2 gal. of methyl alcohol injected at a fixed point. There has been trouble with instrumentation but this is being ironed out.

Texas Eastern Transmission Corp. proves all meters with a loop system, similar to a measured section, and makes sales on the basis of meters.

Interface detection . . . There was a question as to whether any company routinely uses automatic interface detection for products-line switches.

Salt Lake Pipe Line has employed radioactive isotopes for interface detection for 9 years. The operator makes valve switches manually, but on indication of the detector.

The West Texas Gulf crude line makes switches based on a capacitance analyzer and a Gulf-affiliated products line makes automatic cuts at sales terminals, but not on the main line.

One panelist suggested that it was not lack of ability but lack of fortitude which was holding back this step in automation.

by Panel

Handling of contaminated product is done in a variety of ways. The gasoline-gasoline interface is easily blended off to the lower grade. The gasoline-distillate transmix is sometimes trucked back for fractionation, sometimes sold, sometimes blended. Half of a JP-4 jet fuel-gasoline interface is sometimes blended with the JP-4, with half put in a separate tank for blending with the next batch of JP-4.

Gas turbines . . . Gas turbines recently have found widespread acceptance on certain natural-gas lines, but only limited experience is available in crude and products applications.

Great Lakes Pipe Line reported its gas turbine has been operating 2 years very successfully. Thermal efficiency is below the diesel, but economical fuel (natural gas) is available. Maintenance is much less, small building space is required, the single-stage pump handles 4,000 b.p.h. with 2,000 ft. of head, and it is adaptable to remote operation.

Design life of the blades is 12 years.

Trans-Arabian Pipe Line has operated several unattended stations successfully, burning crude from the pipeline. There have been minor troubles in the hot gas path and cavitation occurs below 100 psi. The turbines operate at 1,600° F. and pump speed is 3,500 r.p.m. Suction pressure is 100 psi. and discharge pressure is 900 psi.

The turbine was described by one company as "the coming thing."

Pipe, coatings . . . Although only a few hundred miles of X-56 high-strength pipe has been laid, there apparently will be no major welding or construction problems associated with it.

Experience thus far is limited to gas lines. Most of the new pipe has been laid by Columbia Gulf Transmission Co. The proposed Transwestern gas line from Oklahoma and Texas to California will be X-56 for all of the main line.

The thinnest wall used for 24 to 36-in. pipe was reported to be .250-in. The largest diameter with this wall thickness has been the 31-in. laid by Trans-Arabian Pipe Line. One company has conducted welding and bending tests with .250-in. wall 36-in. o.d. pipe and may install a short section for testing.

Tanks . . . Since millions of dollars is tied up in tank farms, it's desirable to reduce inventories by cutting down the working level of tanks.

Portland Pipe Line mentioned a new 268,000-bbl. tank which it constructed of a design which permits lowering of the floating roof 12 to 18-in. below the normal level. Another company received quotations from a fabricator for a tank with a trench in the bottom to permit the roof to be lowered to the bottom.

Texas Pipe Line said it has for several years constructed tanks with sumps in the center and a suction line from the sump. It reported no inventory problem. Texas Pipe Line has been adding a 3-ft. ring to get effective capacity equal to design capacity.

The company maintains no water bottom, but empties the tank. The tank is checked for water periodically and the water is drained. One company had trouble with freezing in the sump following a heavy rain and sharp temperature drop.

Salt Lake keeps water on the roof until it is in the lowest position. A trigger mechanism on the float dumps water into the tank and it goes through the product. A newly designed system has the drain up the side of the tank and down the ladder.

Maintenance . . . Contract maintenance is gaining wide favor because it's cheaper, according to statements by several pipelines at the meeting.

The practice is said to have many advantages over regular maintenance crews, especially on a new system which should have little trouble for several years. Four Corners Pipe Line is a good example of the modern trend. All of Four Corners' maintenance is contracted.

Four Corners has pipeline, electrical, and mechanical superviors, but no maintenance gang, mechanics, or electricians.

Platte Pipe Line has a similar situation and says that the contractors are always available when needed and do a good job. Salt Lake has contracted maintenance for 6 years. During that time it has lost by attrition 25 maintenance men. Salt Lake has a few specialists but no longer keeps any heavy-duty equipment or maintenance materials.

Another company reported a saving of 50% in its West Texas district since it started using contractors for this purpose. But this disadvantage was cited: The maintenance operation is no longer a development ground for company personnel; it is the contractor's personnel who are being trained for better jobs.

How states are consuming gasoline. . . thousands of gallons

	1957	1958	% Change
Alabama	911,243	945,722	+3.8
Arizona	419,813	452,485	+7.8
Arkansas	547,622	569,715	+4.0
California	5,461,712	5,743,015	+5.2
Colorado	662,853	684,145	+3.2
Connecticut	725,617	738,891	+1.8
Delaware	184,704	187,432	+1.5
Dist. of Col.	198,012	198,072	+0.03
Florida	1,674,124	1,762,124	+5.3
Georgia	1,194,990	1,232,850	+3.2
Idaho	260,062	271,401	+4.4
Illinois	2,909,898	2,950,956	+1.4
Indiana	1,719,957	1,710,019	−0.6
Iowa	1,126,909	1,175,730	+4.3
Kansas	1,034,972	1,040,439	+0.5
Kentucky	864,500	871,330	+0.8
Louisiana	909,346	940,449	+3.4
Maine	313,516	320,723	+2.3
Maryland	835,222	860,307	+3.0
Massachusetts	1,325,892	1,354,588	+2.2
Michigan	2,564,926	2,577,211	+0.5
Minnesota	1,239,727	1,304,476	+5.2
Mississippi	604,440	621,971	+2.9
Missouri	1,603,377	1,650,234	+2.9
Montana	290,053	292,558	+0.9
Nebraska	581,444	596,984	+2.7
Nevada	135,283	137,971	+2.0
New Hampshire	197,059	197,163	+0.05
New Jersey	1,850,262	1,907,497	+3.1
New Mexico	404,976	444,053	+9.6
New York	3,923,969	4,000,725	+2.0
North Carolina	1,336,306	1,368,670	+2.4
North Dakota	314,231	321,119	+2.2
Ohio	3,129,091	3,120,972	−0.3
Oklahoma	939,609	1,007,642	+7.2
Oregon	633,611	645,815	+1.9
Pennsylvania	3,113,578	3,175,357	+2.0
Rhode Island	242,314	246,181	+1.6
South Carolina	673,644	690,305	+2.5
South Dakota	335,272	342,828	+2.3
Tennessee	1,064,812	1,108,460	+4.1
Texas	4,413,299	4,705,271	+6.6
Utah	312,640	326,850	+4.5
Vermont	123,762	126,250	+2.0
Virginia	1,240,026	1,264,099	+1.9
Washington	953,997	1,009,981	+5.8
West Virginia	502,290	496,871	−1.1
Wisconsin	1,243,382	1,286,897	+3.5
Wyoming	167,288	169,526	+1.3
TOTAL U. S.	**57,415,622**	**59,154,330**	**+3.0**

Gasoline Sales Top 59 Billion Gallons

- **Consumption in 22 states was in billion-plus gallons class last year. Only three states showed a decrease.**

GASOLINE consumption topped a billion gallons in each of 22 states of this country last year, according to the annual gasoline-sales report by the Department of Statistics of API.

The average for the country was 1.23 billion gallons per state. District of Columbia sales amounted to 198 million gallons.

Oklahoma and Washington were the only states added to the list of above-a-billion sales during the year. Gasoline sales in Oklahoma increased 7.2% over 1957. Consumption in Washington gained 5.8%.

California retained first place for the year, with total sales up 5.2% to 5.74 billion gallons. Texas was second in total volume and topped all other states in volumetric gain for the year. Texas consumption showed an increase of almost 292 million gallons over 1957.

The gain in Texas sales for the year was larger than total consumption in 6 states and the District of Columbia.

Big slice . . . Gasoline sales in the top 22 states represented 78.5% of total consumption for the entire country, but the relative rate of gain was about the same as the average for smaller states. The average gain for the 22-state group was 3.09%, or only slightly larger than the 2.80% increase reported for other states.

California was the only state with sales above 5 billion gallons. Two states, New York and Texas, were in the 4-5 billion gallon range.

Pennsylvania and Ohio sales were between 3 and 4 billion gallons. These states also changed positions on the sales list. Ohio ranked fourth in 1957 in gasoline consumption with Pennsylvania fifth. Pennsylvania climbed to fourth place in 1958 and Ohio dropped to fifth.

Michigan and Illinois remained in the 2-3 billion-gallon class. Both states posted smaller percentage gains than the average for the nation. Sales in New York were up 2.0% compared with the country average of 3.0%. Consumption in Illinois gained only 1.4%.

There were 15 states with sales between 1 and 2 billion gallons. This total includes the two new states with sales topping a billion for the first time.

Only three states reported decreases for 1958. Consumption in Ohio dropped a little over 8 million gallons or 0.3%. Indiana sales were off almost 10 million gallons or 0.6%. West Virginia decreased 5.4 million gallons or 1.1%.

The largest percentage gain for the year was chalked up by New Mexico. Sales climbed from 405 million gallons in 1957 to 444 million gallons in 1958, a gain of 9.6%.

The next three states, ranked in order of percentage gains, were Arizona with 7.8%, Oklahoma with 7.2%, and Texas with 6.6%.

Journal Editor Wins Award

W. L. NELSON, technical editor of The Oil and Gas Journal, will receive the Jesse H. Neal Merit Award for Editorial Achievement this week.

Nelson, who is also professor of chemical engineering at the University of Tulsa, won the competitive award for his 1958 series of Journal articles called Process Costimating.

The articles are a step-by-step study of what it costs to change raw materials to products in refineries, natural-gasoline plants, and petrochemical plants.

The award, sponsored by Associated Business Publications, will be made at ABP's spring meeting in Skytop, Pa.

This is the second award that Nelson has received from a national group for his cost studies. In 1957, American Association of Cost Engineers honored Nelson with the association's first award of merit for outstanding contributions in the field of cost estimating.

Nelson's cost studies have been a Journal feature for several years and have included the Nelson Refinery Construction Cost Indexes. Next week for the first time, his studies will include the first in a new series of Nelson Refinery Operating Cost Indexes.

W. L. Nelson
. . . author of "Process Costimating."

Reprints of the award-winning Process Costimating articles will soon be available through Reader Service, The Oil and Gas Journal, Box 1260, Tulsa, Okla.

New Tax System Adopted

. . . by New Mexico legislature. Taxes paid by oil industry will be clarified and simplified under new procedure.

THE OIL AND GAS industry is embarking on a "new era in bookkeeping" in New Mexico with codification of the five crazy-quilt laws under which taxes and levies were previously based.

The old system under which the industry paid sales tax, severance tax, conservation tax, ad valorem tax and state royalty—each under a separate law requiring its own individual method of reporting—was junked by the 1959 legislature.

The legislature created a new Oil and Gas Accounting Commission to administer the new taxing system and to collect royalty fees which previously went directly to the State Land Commissioner.

It also passed new severance, conservation, sales and ad valorem production tax laws, each with standardized definitions, and identical reporting procedures and periods and rules for protest payments, refunds and penalties.

The new accounting commission, like the Oil Conservation Commission, will have as its members Gov. John Burroughs, Land Commissioner Murray Morgan, and a director appointed by the governor. Burroughs named E. S. (Johnny) Walker, former State Land Commissioner and now acting chief of the Bureau of Revenue, as director of the accounting agency. A. L. (Pete) Porter remains as director of the Conservation Commission.

The four new tax laws go into effect September 1, with the first reports due from producers on December 4.

The new accounting system is not expected to change the total revenue to the state from taxes and royalties. They amount to $38 million a year.

Past confusion . . . Fred Moxey, executive director of the New Mexico Oil and Gas Association, believes the new laws will greatly simplify accounting procedures for both producers and for the state.

He pointed out that each of the five levies came into being at a different time and that each was administered by a different state agency.

"There was no uniformity of tax due dates, methods and manner of reporting, tax delinquency dates or provisions for the collection of delinquent tax," Moxey said. "The sales tax and severance tax acts were especially confusing because they covered not only the oil and gas industry but all other natural resources products —and in the case of the sales tax— many other types of business."

Moxey pointed out that the severance tax was based on "gross value at the time and place of severance" but that the same section of the law defined gross value as the "sales value at the first market point."

On the other hand, he noted, the sales tax was assessed on the basis of gross proceeds of sale, and the severance tax on the "current market value."

Units planned . . . Under the new system, the Oil and Gas Accounting Commission will set up production units.

The oil and gas produced and sold from each unit will be of common ownership and each unit will be assigned a simple code number for reporting and accounting purposes.

The operator will report each month the volume and value of oil and gas produced and sold and purchasers will also report the volume and value of oil and gas bought from each production unit. All taxes and royalties due will be calculated on the basis of the reports—providing a complete accounting and audit of each production unit once each month.

Paradox Basin Gets Find

UTAH'S Paradox basin has its first discovery of the year.

Triton Oil Co. and W. J. Owen completed an important, though small, Pennsylvania Ismay zone discovery 10 miles northwest of Bluff Bench field, nearest production. The 1 Bluff Bench pumped 91 bbls. of oil per day from perforations at 5,762-82 and 5,699-5,712 ft. The discovery moves oil to the most northwestern point in the basin.

Another wildcat in the area, Carter Oil Co.'s 1 Government-Fehr & Lyon, 14 miles southwest, swabbed at the rate of 33 bbl. of oil and 20 bbl. of water per day from Paradox Pennsylvanian perforations at 4,967 to 5,018 ft. Carter is installing pump. British American Oil Producing Co. has an indicated discovery between the two wildcats.

Energy Board's Power Reduced

. . . under bill to be introduced in Canadian parliament. Officials curb board's authority before setting it up.

CANADA'S soon to be appointed National Energy Board will have broad powers, but its scope of jurisdiction will not range nearly as wide as was envisioned by the Borden Commission, which proposed its formation.

In seeking parliament's approval to bring in a bill setting up the board, Trade Minister Gordon Churchill last week gave members a glimpse of what is to be expected in the bill. It likely will be introduced in its entirety later this week.

The most significant departure from the Borden report recommendations is the absence of any formula for deciding a fair rate of return on the investment of pipeline companies.

The commission has suggested such a formula be set by the energy board and this, of all the recommendations carried in the first Borden report, was the most heavily attacked by the oil and gas industry.

Churchill explained that while there is no fixed formula, the board can maintain sharp security over the returns to pipeline companies and keep them within reason by virtue of its rate-setting powers.

Here are the highlights of information pertaining to the energy board's powers, so far revealed by the trade minister:

. . . **Setting of tolls** pipelines may charge for transporting natural gas or oil.

. . . **Fixing the price** which may be charged by pipelines selling natural gas for export.

. . . **Approving** certificates of approval for construction of pipelines across interprovincial boundaries.

. . . **Issuing licenses** for export or import of natural gas.

The government proposes to hold in abeyance the board's power over the export of crude oil. Purpose is to give the government time to study the upcoming second Borden report, which deals specifically with oil marketing, before deciding how this phase of the industry should be handled.

Gas exports . . . Churchill also said the government favored export of natural gas and hopes for speedy action on the part of the energy board to bring this about.

He gave no hint, however, of special early treatment for Trans-Canada Pipe Lines, Ltd., which was given assurance of export approval by the old Liberal government only to have it withdrawn when the Conservatives took over the federal reins.

Also to the relief of the industry, Churchill announced that export permits would be for periods of 25 years, not 1 year as the Borden report recommended, and that arrangements would be made with the U. S. Federal Power Commission to expedite proposals for movement of natural gas over the international boundary.

Generally, the broad outline of the board's function as given by Churchill has found favor in all corners of government and oil and gas industry.

Even opposition members in the House voiced approval, but most urged immediate action on the question of gas export.

CATC Gas Case Pondered by Supreme Court

• Court's ruling on appeal expected to determine extent of FPC's authority in granting gas sales certificates.

THE SUPREME COURT last week took under advisement an appeal from a circuit court order which has clouded one of the largest gas sales ever made in interstate commerce.

The case is expected to determine the Federal Power Commission's authority to grant unconditional certificates for interstate gas sales without first finding producer rates to be just and reasonable.

Involved in the case are offshore gas reserves estimated at 2 trillion cubic feet or more. The gas, now being produced by the CATC group off the coast of Louisiana, is being delivered to Tennessee Gas Transmission Co. under long-term contracts.

Initial price of the gas was set by contract at 21.4 cents per M.c.f., plus state tax reimbursements now amounting to 1.5 cents per M.c.f. The FPC authorized the sale in June 1957 after the four producing companies declined certificates conditioned on an initial price of 18 cents.

In June 1958 the Circuit Court of Appeals at Philadelphia held that the FPC lacked statutory jurisdiction to grant the certificates.

The case was appealed to the circuit court by the Public Service Commission of the state of New York and two utilities, Long Island Lighting Co. and Public Service Electric & Gas Co. It reached the Supreme Court on separate appeals by the four producing companies and Tennessee Gas.

Cancellation possible . . . In oral argument before the Supreme Court last week a TGT attorney said the producers had given notice they would cancel their contracts and sell the gas intrastate unless acceptable certificates were granted.

The attorney, Harry S. Littman, pointed out that there is no means under the natural gas act whereby a producer can be compelled to sell gas in interstate markets.

David T. Searls, representing the producers, hinted that it may still be possible to withdraw the gas from interstate commerce if the present certificates are held invalid. He said he didn't think the producers in that case would have to go to the FPC to ask for abandonment of service.

The producers — Continental Oil Co., Atlantic Refining Co., Tidewater Oil Co., and Cities Service Production Co.—started deliveries from the offshore fields last summer. TGT laid about 55 miles of underwater pipe to connect the reserves to its main pipeline system.

Kent H. Brown, counsel for the New York Public Service Commission, said gas prices in the Louisiana area had risen in one step from 18 cents to the new rate established by the offshore gas.

Under questioning by Justice Felix Frankfurter, he agreed that production costs may be greater offshore than onshore.

"Within hours" after the price was established offshore, Brown added, it became the going rate in negotiations for onshore gas.

Justice John Marshall Harlan pointed out that the commission took producer prices in consideration in trying to attach a rate condition. "What more can they do?" he asked.

Union Merger Out

. . . for now after OCAW, ICAW disagree on board.

DISAGREEMENT over the type of executive board to be established is blocking merger of the International Chemical Workers of America with the Oil, Chemical and Atomic Workers International Union.

A merger committee, composed of 20 members from each union, recessed a recent Chicago meeting indefinitely after a year of preliminary discussion on the proposed affiliation.

An official at OCAW's Denver headquarters said the talks probably will be resumed, but he declined to predict when the merger might be effected.

Officers of both unions had hoped the Chicago meeting would be able to draft a proposed constitution to be submitted to the annual conventions of the two organizations in Cleveland, Ohio, next October 3.

The 210,000-member OCAW has been insisting on an executive board composed of rank and file members elected from districts representing geographical sections of the country. This board has the power to review and reverse actions of national officers and administrative officials appointed by the president. The Akron-based ICWA, with membership totaling about 80,000, has an executive board consisting of delegates at large elected in national convention. This board does not exercise power of review or reversal.

CIG Rates Are Frozen

THE COLORADO Public Utilities Commission has frozen rates charged by Colorado Interstate Gas Co. for direct sales of natural gas, pending a hearing to be set later.

These sales are made to industries and to local utility companies which use the gas to generate electricity. Direct sales amount to 25 to 30% of the Colorado Springs pipeline firm's total business in Colorado.

The commission order followed the filing of complaints against CIG by its two largest direct customers in Colorado—Public Service Co. of Colorado and Colorado Fuel & Iron Corp., operator of huge steel mills at Pueblo, Colo. Both firms allege overcharges by CIG.

CIG has refunded about $38.5 million to 12 distributing companies for retail gas rate overcharges involved in three cases dating back to January 1, 1954 (OGJ, Dec. 29, 1958, p. 80).

watching WASHINGTON

Joe Reilly

"Nice guys" play cards close to vest . . .

ONE OF THE MOST baffling things about the oil-import program is the appeals board.

The board, authorized by presidential proclamation, is composed of one official each from the Departments of Interior, Defense, and Commerce. It has broad powers to modify import quotas, to review the suspension of import licenses, and to grant in "special circumstances" new quotas for crude oil and unfinished products.

Members of the board, all business men in Government, include a mining engineer, former board chairman of a chemical company, and former president of a paper company. None has had much experience with oil, either in government service or in private industry.

Asst. Sec. Royce A. Hardy of Interior is chairman of the appeals board and probably the most experienced in petroleum affairs. A mining and metallurgical engineer, he worked for the Bureau of Mines a few months in the early 1940's. He later spent several years in the mining industry in Nevada before returning to Interior as assistant secretary for mineral resources in October 1957.

Commerce's representative, Asst. Sec. Carl F. Oechsle, studied law and business administration in night school. He worked in a Philadelphia bank from 1917 to 1919 and later held various executive positions in the manufacture of construction equipment. Oechsle (pronounced Oshlee) became head of Tubed Chemicals Corp. at Easthampton, Mass., in 1948. He took a leave of absence for government activities in 1953.

Philip LeBoutillier, Jr., third member of the board, is deputy assistant secretary of Defense. A graduate of Princeton University, he was assistant to the president of Toledo Scale Co. and later president of Ottawa River Paper Co. before taking over his Defense Department post last month.

THE BOARD STARTED HEARING appeals almost immediately after its creation. Members obviously didn't have much time to study the regulations under which they were to operate.

Regulations forbid the sale of an import allocation, for example. However, an importer may exchange crude or unfinished oil for domestic crude or unfinished oil provided the oil acquired is to be processed in his own refinery.

In the early hearings, lawyers had a hard time getting these points across to some of the board members. On April 17, one member of the board noted that a certain petitioner could "still buy oil as a broker from someone else who has an allocation. . . ."

After some discussion of this point, the oil broker's attorney interrupted. "Mr. Secretary," he ventured, "might there not be a question—and I raise it although I don't know the answer—might there not be a question about one with a quota selling it to someone who doesn't have a refinery?"

The board member looked puzzled. "Could well be," he agreed.

Ten days later, at another hearing, another board member inquired about the prohibition against a company's acquiring an unused allocation of foreign oil.

"That is right," explained the attorney. "It cannot exchange."

"Can it purchase it?" asked the board member.

The lawyer pointed out patiently that the rule was "even more severe" on the sale of quotas.

"You know," one fellow said the other day, right after the company he represents had presented its appeal, "they seem like real nice guys."

Perhaps he wasn't aware that the board is just as stern as it is polite. A check last week, after the board had been in business a month and a half, revealed that it had approved new or increased quotas in only 5 of the 34 cases in which it had ruled.

Petrochemicals to Continue Fast Pace

• Ammonia is the only product with too much capacity, but the rest of the industry faces a bright future. Look for polypropylene to emerge as one of the comers in the near future.

THE PETROCHEMICALS industry is developing at an outstanding growth rate and will continue to grow. Main exception to this growth pattern is ammonia which is suffering from acute overcapacity and for which no expansion is foreseen for several years.

The annual growth rate for petrochemicals is 7%, the same as the rate for the entire chemical industry. Growth rate for industry as a whole is 3% annually.

This bright picture for petrochemicals was painted by T. L. Cubbage, Phillips Petroleum Co., Bartlesville, Okla., at the AIChE meeting in Kansas City last week.

Cubbage outlined these points in his analysis of the present and future status of petrochemicals:

... **Ammonia capacity** stands at 4,500,000 tons annually, while annual demand totals only 2,700,000 tons. No expansion is foreseen until available capacity is more fully loaded. Increased food demands of our swelling population will ultimately boost nitrogen fertilizer production above present levels.

... **Aromatics** will become more generally available at refineries and a more extensive chemical program based on aromatics should develop. Benzene, toluene, and xylenes are starting materials for many intermediates used in the rubber and plastic industries. The refiner's participation in this scheme should increase.

... **Availability** of research facilities and trained technicians may be the key to the best location for future petrochemicals installations. While producers of large volume, low-priced materials are obliged to locate close to markets or with an eye to cheap transportation, location is not important to the producer of higher-priced chemicals.

... **Petrochemical acetylene** may soon vie with carbide acetylene for chemical markets. Improved processes for production of acetylene from oil or gas are now available and are receiving careful study. The petrochemical industry will receive a healthy boost if one or more of the processes turns out to be competitive with the carbide process.

... **Ethylene production,** now derived from cracking ethane, propane, or butane, may ultimately depend on the use of heavier oil fractions. Development work is needed in this area.

Nitrogen outlook . . . Average annual increase in nitrogen consumption should be 100,000 to 150,000 tons per year until 1963. This means that excess capacity will still exist in the U. S. at that time, even if present capacity is not increased in the interval, according to F. L. Agel, Allied Chemical Corp., New York.

Actually, however, over the long range the minimum anticipated expansion of agricultural, industrial, and military requirements appears sufficient to insure sustained growth. Total annual nitrogen demand in the U. S. will probably reach 6,000,000 tons by 1975, he said.

It has been estimated that U. S. requirements for food and clothing in 1975 will call for an increase in crop production of one-third and an increase of at least 40% in need for livestock and livestock products.

This will have to come from the same acreage as is now being farmed and higher yields per acre provide the answer. U. S. farmers have a long way to go. Annual consumption of nitrogen per arable acre is 10 lb., compared with 31 for United Kingdom, 46 in West Germany, and 156 in the Netherlands.

Ethylene purification . . . Acetylene removal from ethylene by extraction with acetone is a practical, economical process.

H. C. Schutt, Boston consultant, said its application for making high-purity ethylene should be compared with catalytic hydrogenation of acetylene, the process now most commonly used, in the planning stage of an ethylene production project.

Most ethylene is produced by high-temperature cracking of ethane, propane, butane, and distillate oil fractions. The conversion products contain varying amounts of acetylenes and other impurities. Acetylenes and diolefins, as well as acid gases, can be tolerated only in trace quantities if the ethylene is used for polymerization, he said.

Selective absorption with acetone may also be applied to a propylene production process for removal of the impurities, methylacetylene and propadiene, Schutt said.

Polypropylene future . . . One of the latest arrivals in the world of plastics, polypropylene, is expected to join the front ranks of the hydrocarbon polymer field in 3 years. This strong statement was made by W. R. Gutman, Catalysts & Chemicals, Inc., Louisville.

This new plastic is expected to rival the well-established polyethylene in a few years because of its superior properties of color, strength, and workability. Polypropylene, an Italian discovery, entered the plastics field about a year and a half ago, and production in the U. S. by several petrochemical companies is now planned.

The propylene used for polymerization will need to be of exceptionally high purity. This should pose no real problem because the major impurities can be reduced to tolerable levels simply and effectively, he said.

Carbonyl sulfide can be converted catalytically to less than 10 p.p.m. in the product stream without destruction or loss of propylene. Methyl acetylene and propadiene have been successfully removed catalytically to less than 30 p.p.m. by selective hydrogenation without loss of propylene.

In fact, under some process conditions, methyl acetylene and propadiene have been converted almost quantitatively to propylene, increasing propylene production from 1 to 3%, Gutman said.

Record Tank Is Completed

TIDEWATER Oil Co. has put the world's largest floating roof tank in service at its Delaware City refinery.

The 187-ft. diameter tank, which is 56 ft. high, holds 274,000 bbl. of crude oil. It's made of formed steel plates ranging up to 1½ in. thick.

Graver Tank & Manufacturing Co. officials said to the best of their knowledge it's the largest floating roof tank ever built, although larger tanks of the cone-roof type have been constructed. This is one of two tanks Graver is building for Tidewater. When the second tank is completed in June, the 130,000-bbl. refinery will have storage facilities for 2.148 million barrels of crude oil.

Pipelines Use Computers

. . . to free men from the repetitive and time-consuming calculations needed to design and operate a line.

COMPUTERS are helping pipeliners save money both before and after a line is built.

Several ways pipeliners are saving time and money with computers were outlined last week at a meeting of the American Institute of Chemical Engineers in Kansas City. Speakers showed how in gas-line work the computers are powerful and fast tools for analyzing the design and operations of a line.

Gathering systems . . . Use of a computer program results in better design of gathering systems and provides a closer check on when additional compressor facilities or piping changes are needed.

This evaluation of a computer program for gas-gathering systems was made by Bill G. Giles, Phillips Petroleum Co., Bartlesville, Okla.

Problems which are encountered in the design or analysis of complex gathering systems arise primarily from the sheer volume of calculations which must be made. The computer is made to order for making these many repetitive, time-consuming calculations.

Gas-gathering systems are ordinarily in a state of evolution from the time they are built until the fields they serve are abandoned. Declining field pressures, shifting loads, and addition of new loads in unexpected quarters combine to force periodic changes in piping and addition of field booster compressors, he said.

Gas pipeline design . . . The computer is a valuable aid in the design of a long-distance gas-transmission pipeline, according to Henry B. Martch, Jr., El Paso Natural Gas Co.

A digital program can be set up to calculate flows, compressor applications, and looping requirements, Martch said.

The design problem is simple to state. A given quantity of gas must be transported from source to delivery point at minimum cost. The designer must answer the questions: How much horsepower is required, and what size pipe should be specified? While the burden of proof always remains with the designer, the computer provides the necessary tools for rapid investigation of the various solutions to the problem, he said.

The designer specifies flow route and design conditions. A profile of the line is then developed and reduced to punched data cards. Physical properties and flow conditions of the gas are also put on punched cards.

Flow calculation at El Paso Natural involves the use of the modified Panhandle Eastern flow equation. The calculation determines pressure loss between data points, with continual adjustments for static head conditions. Compressor stations are brought into the calculation by means of two data cards which outline station characteristics and available horsepower, Martch said.

The computer program is set up for "master control," which means a flexible means for handling the calculating sequence for the flow, compressor, and loop routines. The loop calculation provides for installing a parallel line to alleviate excessive pressure conditions.

Under master control the computer determines pressure drop between data points and examines horsepower requirements. The computer may direct the use of all existing horsepower, the use of portions of existing horsepower, or the addition of horsepower. If loop pipe is required, the computer will determine length and location, Martch said.

Complex networks . . . A new approach to the evaluation and design of pipeline networks by digital computer enables the engineer to handle more complicated systems, according to R. J. Hunn of Du Pont.

The program has these characteristics which make it worthy of consideration:

. . . Pumps, strainers, and orifices are treated as integral members of the network.

. . . Three-dimensional pipeline system problems can be solved.

. . . A wide variety of piping network systems can be handled with only minor variations of input data.

the JOURNAL *said . . .*

50 years ago

May 20, 1909

The great Palmer 1 Blochmann well in Cat Canyon is the wonder of California. Completed with 4½-in. casing at 3,200 ft., it flows 4,000 to 5,000 bbl. daily half open and 9,000 to 10,000 bbl. daily full capacity. Its 14° to 14.5°-gravity oil flows as "molasses in winter" when gas pressure is lost after standing.

Construction of proposed 350-mile Busch-Everett gas line from Caddo field in northwestern Louisiana to Baton Rouge and New Orleans is delayed pending decision on laying 18-in. or 24-in. pipe.

U. S. District Court for Eastern Texas upholds Layne & Bowler Co.'s patents covering manufacture of oil and water well screens and strainers in patent infringement suit against Southern Car Manufacturing & Supply Co.

Pennsylvania crude sells for $1.68 per barrel compared with Oklahoma crude at 30 cents per barrel.

25 years ago

May 24, 1934

Stripper-well owners at Tulsa meeting organize National Stripper Well Association with William Bell of Robinson, Ill., as first president. Thirty-two state and district associations are represented.

Eugene Holman, one of the younger executives of the Standard Oil Co. (N. J.) companies, is elected president of Creole Petroleum. He has been active in several South American and Mexican subsidiaries of the Jersey company since coming to New York from Humble Oil & Refining Co. in 1929.

Socony-Vacuum Corp. closes contract with oil administration of the USSR for sale of 500,000 bbl. of refined products, valued above $1,000,000, in first transaction with Soviets.

HEADLINES: Oil industry increasing its importance as user and manufacturer of chemical products . . . Eighth annual International Oil Exposition closes with many records broken . . . Arkansas oil drilling takes decided upturn.

10 years ago

May 26, 1949

World's longest string of casing run and cemented without trouble in Superior Oil's Pacific Creek wildcat in Sublette County, Wyoming. String totals 19,765 ft. of 7-in. pipe, 1,031 ft. longer than previous record.

Rumors of oil shows in Price Drilling Co.'s Kline wildcat in Minot area of Ward County, North Dakota, stimulates lease play in Williston basin and marks step toward state's first production.

Syria clears way for completion of 1,140-mile, $200,000,000 Tapline project to carry oil from Arabian American Oil Co.'s fields in Saudi Arabia across desert to the Persian Gulf.

HEADLINES: Shell Oil Co. completed huge petrochemical expansion . . . Coastal Pipe Line Co. plans 1,000-mile natural-gas line from Texas to Norfolk, Va. . . . Humble Oil & Refining Co. gets its first California discovery . . . Drilling activity stepped up in Mexico.

A GAS FLARE marks an automatic pump station deep in the Sahara Desert of Algeria where Hassi Messaoud field is being developed.

Hassi Messaoud: A Giant Field That

• Two French companies are busy developing this field in the Sahara Desert. They have 15 rigs working 7 days a week. Thirty wells have been completed and reserves conservatively are estimated at 3.5 billion barrels.

(Sixth in a Series of Special Foreign Reports)

Paul E. Swain
International Editor

IT'S ALMOST like a Frenchman preferring water to champagne, but now that oil-thirsty France has found sizable reserves in the Sahara, the crude is a little too rich for the French appetite.

The high-gravity, sweet crude which the French are working so feverishly to develop just doesn't fit the French consumption pattern. With a gasoline cut of from 40 to 45%, the 44°-gravity paraffinic oil is already giving French planners headaches. They'd like to swap it for heavier crude with a high fuel-oil yield. If they can't, the French are going to have gasoline running out their ears.

They're talking to American companies, but say that so far nothing concrete has developed in the way of a trade arrangement. The U. S. gasoline market appears to be the obvious target for a crude of this type, but import restrictions make an easy solution to the French problem almost impossible.

How big is Hassi Messaoud? . . . There has been a lot of speculation, discussion, and downright disbelief in some quarters about the actual size of the big field 950 km. (about 590 miles) south of Algiers.

French politicians in Paris have talked glibly and glowingly in terms of billions of barrels of reserves since the discovery more than 30 months ago. Engineers in the field are far more conservative. They recognize the problems of producing a tight pay zone. But, the extent of the field already proved and the thickness of the pay are two things that can't be disputed.

"It's a helluva big oil patch," says a Texas engineer now transplanted in the Sahara.

With 30 wells completed the French figure conservatively they have proved a field of 1,300 sq. km. (slightly more than 500 sq. miles) with a minimum of 3,500,000,000 bbl. of proved reserves based on only a 20% recovery of oil in place.

With 12 heavy rigs, one medium rig, and two well-servicing rigs working 7 days a week, the field is getting bigger every day.

The operation . . . Development of the field is a peculiar joint operation that is not joint at all.

AN ANCIENT water well just off an old desert trail gave Hassi Messaoud field its name. The water well is known as Hassi Messaoud. Hassi means well. The original Hassi Messaoud is dry, but the modern version has oil wells capable of producing from 40,000 to 45,000 bbl. daily.

Grows Daily

The productive area proved so far is almost equally divided by concessions held by two French companies, S. N. Repal, which drilled the discovery, and C.F.P. (A), the Sahara affiliate of France's big Cie. Francaise des Petroles.

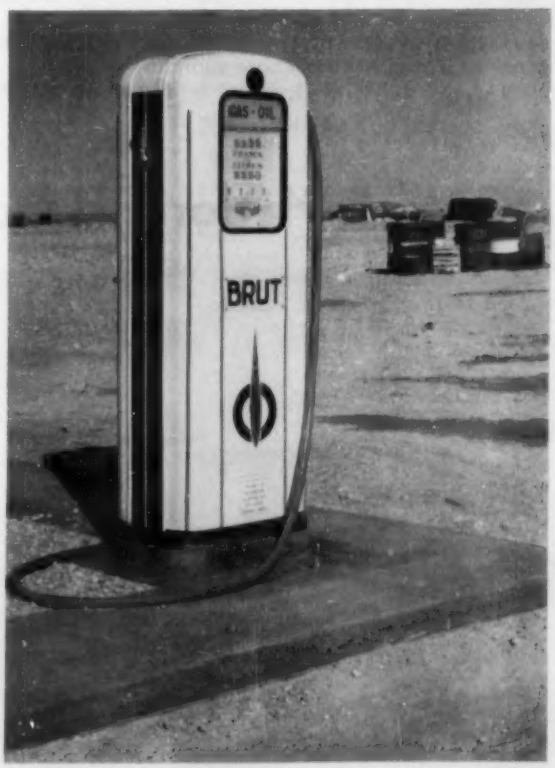
It's an operation that would make an economy-minded U. S. board of directors blanch with horror. Instead of working as a unit, with one company operating for both, the two companies are developing the field independently.

There are two of everything at Hassi Messaoud. Two air strips, two camps, two administrative setups, and duplicate groups of all kinds of equipment. C.F.P. (A) operates in the north portion of the field. S. N. Repal in the south.

The only joint operation so far is the pilot production station on the C.F.P.(A) side of the dividing line. Here about 12,600 bbl. daily from both companies goes through remote controlled separators. The gas is flared, and the crude pumped through the "baby" 6-in. pipeline to Touggourt and the railhead.

Problems . . . French drilling and completion experience was limited to say the least when the early wells were drilled. This has created some problems that will have to be corrected if some of those wells are to produce. Mud damage to the holes is one big problem.

Hugh Faulk, former reservoir engineer for Atlantic Refining Co. and now with the consulting firm of D. R. McCord & Associates, was called in by



THE SWEET, 44°-gravity crude from Hassi Messaoud field is stabilized and used throughout the field for diesel fuel. This is one of the pumps which handles the stabilized crude.

C.F.P.(A) 2 months ago to cope with this and other reservoir problems.

Ken Blair, an Irishman, Dick Rousseau, a Canadian from Calgary, and a whole crew of French engineers give C.F.P.(A)'s engineering force a real international flavor.

Ten of the Hassi Messaoud wells are slated for a cleanout between now and October to get them ready for full-scale production when the 24-in. pipeline is completed. Some of them have mud plugs of 100 to 400 ft. in the hole. Once these are put in shape, Faulk believes they'll produce far better than they did on test. They should produce 40,000 to 45,000 bbl. daily now and Faulk believes this can be increased by as much as 30%.

His big project is a crash program to fracture four wells as an experiment to prove the French don't really have another Spraberry on their hands. Equipment is being rounded up in Europe for the fracturing project. The Cambro-Ordivician pay at Hassi Messaoud is already marked by fracture conductivity and Faulk thinks the fracturing at 7,000 to 8,500 psi. pump-in pressure will prove highly successful.

The French have found that 2⅞-in. tubing is not big enough and they are now working on replacing this with 3½-in. to coax more production from the wells.

The big problem in the field could be casing failures similar to those experienced several years ago by U. S. companies in the Williston Basin.

Hassi Messaoud has massive salt zones, some as much as 2,500 ft. thick, topped by 600 ft. anhydrite strata at about 8,000 ft. The high pressure calcium chloride zones have a pressure gradient of 1 psi. per ft., equal to the weight of the overburden. The French manufactured casing won't cope with this.

The pay at Hassi Messaoud is apparently highly eroded and gross thickness found in wells varies a lot. Thinnest yet was at Omg 57, the 15-mile stepout to the north drilled by C.F.P.(A). The well is still not considered completed as a producer, but it found just under 100 ft. of pay. Tests of this thin section have shown indications of a strong water drive.

The record pay was in Omj 53 completed 3 months ago with 646 ft. of oil sand.

The camp . . . Life in the Sahara can be just about as uncomfortable as any place on earth with 120° about standard for the summer months.

C.F.P.(A) has done as much as it can to make it a liveable spot in which to work. It calls its camp "Maison Verte," the green camp, and has gone to great pains to make it green. Water, of course, is the answer and the French have found plenty of water to make flowers and grass flourish in the center of the camp.

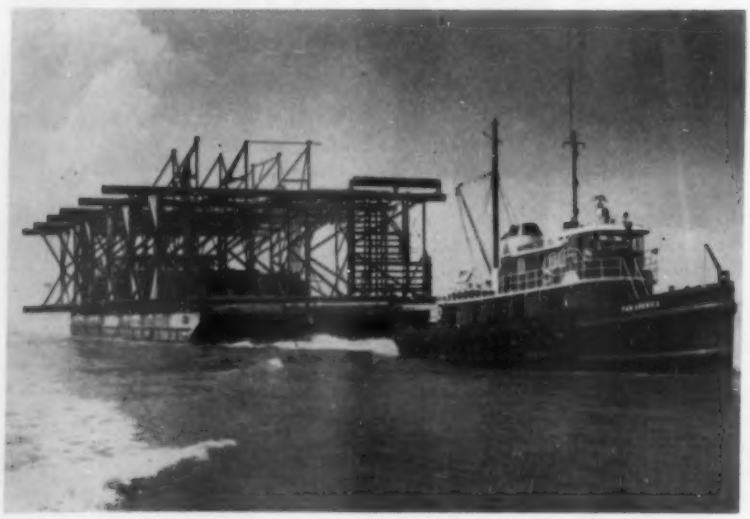
The camp boasts three well-stocked, open-air bars, a restaurant worthy of Paris' Left Bank, air-conditioned housing, and a theater.

They all help offset the standard 3-week, 7-days-a-week tour of duty in the desert for personnel. There are no women in the desert and most of the engineering personnel have their families in Algiers. They see them for a week each month during their "recuperation" leave.

Two hotels, each with 400 rooms, are under construction at the field and the dream of Jacques Soustelle, French minister for the Sahara, that a city will rise in the middle of the desert at Hassi Messaoud may be no idle dream.

A Hassi Messaoud service station is without a doubt unique. It's the only one in the world with a diesel fuel pump dispensing crude produced from a well less than a mile away.

27-Well Platform Heads for Gulf of Paria



EN ROUTE to Gulf of Paria is this 27-well platform, built by Brown & Root. It's being towed on the 250-ft. MM-151 cargo barge.

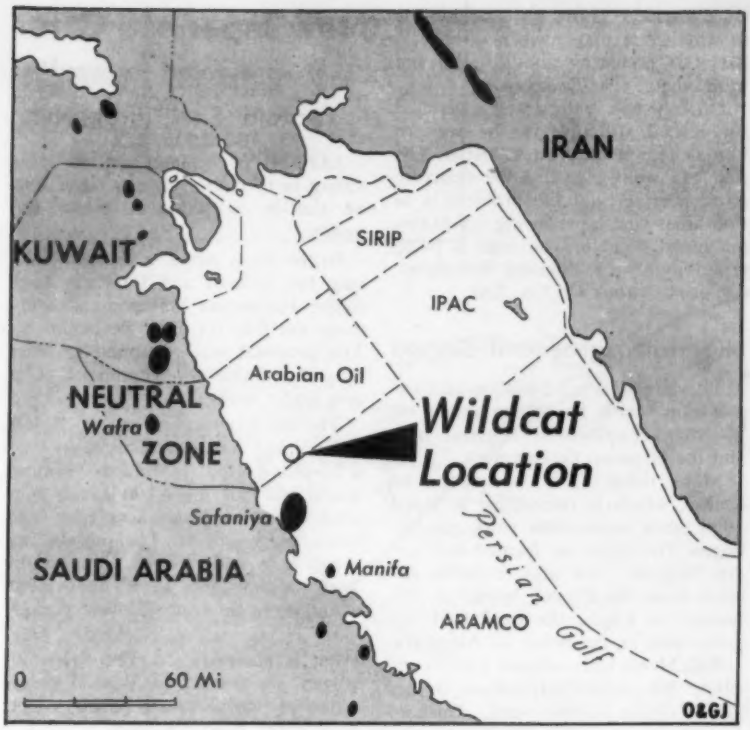
TWO BIG BARGES—one carrying a 27-well platform and the other the equipment to set it—left Galveston Bay on the 17-day voyage to Gulf of Paria drilling site of Paria Operations, Inc.

Brown & Root Marine Operators, Inc., Houston, prefabricated the platform and loaded it on the 250-ft. MM-151 cargo barge for towing to Paria. Also making the trip is the 260-ft. Herman B, Brown & Root's derrick barge.

The 2,500-hp. tug, the M. P. Anderson, is towing both vessels.

The Herman B carries a 300-ton hammer-head crane and a 75-ton revolving crane to place the platform in position at the drillsite.

Companies associated in the joint venture in Venezuela are Continental Oil Co. of Venezuela, Texas Petroleum Co., Ohio Oil Co. of Venezuela, Venezuela - Cities Service Petroleum Corp., and Richfield Oil Corp.



Persian Gulf to Be Tested

. . . by Japanese company. Indiana Standard, Italians, and Shell also plan drilling operations this summer.

THE FIRST well to be drilled off the coast of the Neutral Zone will be spudded next week.

The test will be drilled for a Japanese company, Arabian Oil Co., from an American-owned drilling platform that was towed about 11,500 miles from the U.S. Gulf Coast.

Arabian Oil hopes to break into the big Middle East production picture with its drilling program in the Persian Gulf. The first wildcat is projected to 8,000 ft., which is deep enough to test all known producing zones in the area. The wildcat is spotted north of the Persian Gulf's best offshore field, Safaniya, which is being developed by Arabian American Oil Co.

The Japanese company broke the 50-50 profit split in landing its concession off the Neutral Zone. It signed a deal with Saudi Arabia giving the country 56% of the profits and signed a deal with Kuwait for 57% (OGJ, May 19, 1958, p. 116).

The first well, just north of the southern border of the Arabian Oil concession, will be 25 miles offshore in water 102 ft. deep.

The company apparently plans to drill several wells on the concession. Arabian Oil has a 2-year drilling contract with two companies, International Drilling Co., a Hague-based firm, and Reading & Bates Offshore Drilling Co., Tulsa. The contractors will be working on a day-rate basis.

The wildcat will be drilled from the "C. E. Thornton," a Le Tourneau-type platform owned by Reading & Bates. The Tulsa company also is furnishing a tender to work with the platform. Both were towed from the U.S. Gulf Coast. International Drilling, which operates primarily in the Eastern Hemisphere, will serve as operator for the drilling.

Troublesome trip . . . The 3,000-ton platform had its troubles during the 11,500-mile trip from the Gulf of Mexico to the Persian Gulf.

During a storm in the Mediterranean, it broke the two lines to its tug and was adrift for 2½ days in rough seas.

There were actually three separate tows made in preparation for the Neutral Zone drilling operation. A tender, the J. W. Bates, and two workboats, each with a crewboat riding piggyback, began their trips a month after the Thornton left and arrived 3 to 4 weeks ahead of the Thornton. Their voyages were uneventful.

Other drilling . . . Two other companies are drilling in the Persian Gulf, and drilling will start sometime soon by three others.

Aramco is continuing its development program off Saudi Arabia south of the Arabian Oil concession, and Abu Dhabi Marine Areas, Ltd., is drilling its second hole off the Trucial Coast. Abu Dhabi Marine, owned by British Petroleum and Cie. Francaise des Petroles, indicated its first well was a discovery.

Two wildcats will be spudded soon at the head of the Gulf in concessions adjoining Arabian Oil's acreage.

A platform being towed from Orange, Tex., is due to be delivered to Iran Pan American Co. (IPAC) in early June. The Indiana Standard subsidiary holds a concession off the southern coast of Iran.

The Italian Government also will drill this summer on its concession off Iran. The operating company, SIRIP, is building a permanent platform for the operation.

Shell of Qatar is the third company expected to drill in the Gulf soon. Shell has drilled several holes off Qatar and currently is repairing its drilling platform.

$10-Million Buy Made

THE LARGEST single purchase ever made by a drilling contractor—a $10-million-plus deal—has been made by Southeastern Drilling Co. of Argentina, S.A., from Dresser Industries, Inc., and Ideco, Inc.

The package deal includes 20 rigs and other equipment, supplies, and services. In signing the agreement, officials of the firms said the initial portion of the sale is in excess of $10 million.

SEDA, affiliate of Southeastern Drilling Corp., Dallas, will use the equipment and services in Argentina where it has one of the largest drilling contracts ever awarded. SEDA will drill 1,000 wells in the Comodoro Rivadavia region of southern Argentina for Yacimientos Petroliferos Fiscales (YPF), the Argentine Government oil agency (OGJ, Apr. 27, p. 104).

The 20 Ideco rigs include five Dual Ramblers, rated at 7,500 ft., five skid-mounted Ramblers, and 10 trailer-mounted Rambler rigs for completions and servicing.

Dresser also will supply road-building equipment and housing.

Oil Search Active

. . . in Eastern Hemisphere some areas unheralded.

THE PACE of exploration in the Eastern Hemisphere is continuing without letup, even though the limelight is on a comparatively few countries.

Here are developments in some of the less closely watched areas:

. . . **Spain.** One of Europe's deepest wells has been bottomed at 16,474 ft. The Alda 1 wildcat is located 20 miles east of Victoria in the northeast part of the country. Partners in the well, Cia. Investigacion y Explotaciones Petroliferas, S.A. (CIEPSA) and C. Deilmann Bergbau, a West German firm, plan to test gas shows found in several zones.

The companies have two more rigs drilling. A wildcat at Treveno is near 10,000 ft., while a well at Alloz is at 4,130 ft.

. . . **Denmark.** Danish American Prospecting Co. plans to discontinue exploration after drilling a flock of dry holes. The Standard Oil Co. (N. J.) affiliate had taken over a Gulf Oil Corp. concession over the entire country 2 years ago.

. . . **Angola.** Petrofina is studying a new discovery at Cacuaco, but has not yet determined its importance. The find lies a short distance east of the small Luanda field.

. . . **Burma.** Tests are being made on Kyaiklat 1 wildcat drilled to 12,000 ft. in the Irrawaddy Delta. Burmah Oil Co. (1954), Ltd., gives no hint as to whether it may have a discovery, but it is preparing another drill site in the delta, near Dedaye.

. . . **Pakistan.** A third well is planned for Karsal structure in the western Punjab region of West Pakistan. The first two wells indicated the structure is oil bearing, and the problem is to find areas where producing conditions are more suitable. The area is being tested jointly by Pakistan Petroleum, Ltd., and Attock Oil Co., Ltd.

Nigerian Agreement Signed

TERMS FOR a 2.5-million-acre exploration license have been agreed on by Mobil Exploration Nigeria, Inc., and the Nigerian Government.

Mobil holds 100% interest in the license, which is retroactive to April 1958 when exploration work actually began. The rights are located in Western Nigeria. The area included extends from the French border at Dahomey, to Lagos, the capital of Nigeria, and as far north as Abeokuta.

The Mobil International Oil Co. affiliate has conducted surface studies and offshore seismic work. Onshore seismic surveys are now in progress.

The license lies northwest of the Niger Delta region where Shell-BP Petroleum Development Co. produces more than 5,000 bbl. daily from two fields, Oloibiri and Afam. A pipeline outlet is being built from a third field, Bomu, and Shell-BP has agreed to start talks on a 10,000-bbl. refinery, which must be built when output reaches that level.

New Japanese Offer

. . . presented to Sumatra for old Shell properties.

JAPANESE businessmen are persisting in their efforts to make a deal on shut-in oil fields in North Sumatra.

In the latest move, a Tokyo syndicate has offered a $20-million loan to the Indonesian Government's Permina Oil Co. for field development. The proposal was presented to Ibnu Sutowo, president of Permina. It is now under study.

The offer is for yen credits of $50 million and technical assistance over a 10-year period. In return, Permina would sell half the oil in Japan at a price based on production costs and below posted price. The margin between sale and posted price would apply against the load. Repayment would be made over a 30-year period.

What is planned . . . The fields involved are pre-World War II properties of Royal Dutch - Shell which have never been returned.

The first stage of the proposed program is the restoration of Rantau, Paltabuhan, and Pangkalansusu fields. Only a trickle of production is coming from a reported 170 flowing wells in the area. Work would include replacement of pipelines and improvement of Pangkalansusu harbor. Extension wells would be drilled in the second stage of the program.

FOREIGN BRIEFS . . .

An 8,000-sq. mile airborne magnetometer survey is being made in Italy for Adriatic Petroleum Corp. by Aero Service Corp's International Air Survey Co. A geophysicist is working in Italy with the flight crew to make on-the-spot interpretations.

Signal Oil & Gas of Venezuela will have crude storage capacity of more than a million barrels at Punta Palmas terminal on Lake Maracaibo when it completes two more 170,000-bbl. tanks. Signal now has four of the tanks and also its own offshore loading line. Its crude stream is of different gravity than oil shipped by Sun Oil of Venezuela which also uses the terminal.

Robert H. Ray de Venezuela, a subsidiary of the U. S. geophysical contractor, will move out of Venezuela at the end of June. Caracas reports say most of the equipment and personnel will move to Argentina.

Consumption in United Kingdom rose 25.3% to 620,000 bbl. daily last year. Fuel oil, the leading product, gained 52.7% to 193,000 bbl. daily. Gasoline rose 15.3% to 160,000 bbl. daily. Other products accounted for the remaining 267,000 bbl. daily.

Russia is buying a $6-million chemical plant in England from Petrochemical Engineering Co. and Vickers-Armstrong (Engineers). The plant will be delivered by the end of next year.

Low price and low sulfur content have made Russian fuel oil attractive to British buyers. Local cement manufacturers plan to take six shipments of the Black Sea product this year in exchange for colored cement.

Davis Oil Co., Denver and New York, has taken oil exploration and operation rights on a 11-million-acre concession in Ecuador. The land lies along the west-central coast of Ecuador and was acquired from Universal Mineral Resources, Inc., of Panama.

A 20,000-bbl. refinery being built by the Syrian Government at Home is expected to go on stream in June. Iraq Petroleum Co. will supply crude for the plant, reported at a price slightly below posted prices in the area. Syria is also planning a 4,000-bbl. plant at Qamishli, which will operate on crude from Karachuk field.

Beginning | **API Pipeline Report**

OLD TEXACO-CITIES SERVICE line handles mixtures of crude oil with natural-gas liquids, distillates, and end products. Fig. 1.

One line—four products

Tight-line modifications permit conventional oil line to handle natural-gas liquids, middle distillates, heavy ends, and crude oil in batches

BY A. N. HORNE
Vice President and General Manager,
Texaco-Cities Service Pipe Line Co.

EXISTING conventional crude-oil pipelines can handle a wide variety of the direct and indirect products of oil and gas wells. With modifications, lighter and more volatile hydrocarbons can be added to the list. For future construction, proper basic design could provide for these broader possibilities.

This discussion outlines a limited experience in handling varying mixtures of natural-gas liquids, middle distillates, heavy ends, and crude oil from South Oklahoma to the Chicago area through a conventional crude-oil pipeline system, modified for tight-line operation.

No attempt is made to evaluate the relative economics of the transportation and processing or separation of the stream components. However, this experience does indicate, from a pipeline viewpoint, the feasibility and rather broad possibilities of moving a greater number of petroleum and natural-gas liquids than has been done heretofore through conventional crude or products lines.

Paper presented at annual pipeline conference, API Division of Transportation, Pittsburgh, May 13-14, 1959, under the original title: "Handling Mixtures of Crude Oil with Natural-Gas Liquids, Distillates, and End Products."

History

The pipeline system here briefly described (Fig. 1) was built in 1928 as a crude-oil system, and was one of the first big-inch trunk lines for oil. It consisted of 675 miles of 12-in. pipe from Cushing, Okla., to East Chicago, with load originating in Seminole and Oklahoma City fields. and from other carriers.

The pipe was electric flash weld, bell, and spigot joints, connected by

"Some 28 different pumping combinations have been worked

bare-rod arc welding. The nominal capacity was 70,000 bbl. per day at 750 psi., with two electrically powered and nine diesel stations, and appropriate working tankage at each diesel location.

Branch lines to western Kansas and in Illinois, and an increasing load on the system, prompted addition of six electric and one diesel booster stations, followed by partial, and then complete looping during World War II, which resulted in two parallel lines from Sheldon, Mo., to Wilmington, Ill. This gave a nominal capacity of 120,000 bbl. per day.

A decreasing load since World War II saw a reversion to operation of only the original primary stations on the original main-line segment of the system.

The methods and procedures of this discussion are not entirely new. Many pipelines have from time to time moved natural-gas liquids and other substances mixed with crude. This, therefore, is a brief narrative of evolution from partial obsolescence and restricted usefulness to a broader service.

Development

Beginning in 1938, this pipeline system regularly moved batches of gasoline/crude mixture through conventional tankage and equipment and procedures. These batches originated in Seminole and Wichita areas. The mixtures have averaged around 10% of 26-lb. natural gasoline with 90% crude of varying grades. The batches were usually floated through tankage at intermediate stations, with what has become recognized as normal or average interface mixture.

Recent years have seen increased use and widespread distribution of natural-gas liquids, and the successful development of salt-dome and mine-type underground storage for these products. These developments led to examination of the possibilities of pipeline transportation of propane and butane through existing crude-oil lines, where regular products lines were not available, or could not be justified.

This system, as well as others, has in recent years made experimental batch movements of mixtures of crude and natural-gas liquids with increasing volumes of the lighter products. These movements were successful through the conventional system when vapor pressures of the mixtures were held below atmospheric pressure.

Favorable results and shipper needs resulted in completion during 1956 of plans for moving larger volumes of natural-gas liquids from South Oklahoma to northern markets. The overall plans were based on converting the 675-mile segment of the system from Cushing to East Chicago for tight-line operation; the construction of a 165-mile 6-in. line from East Chicago to Lowell, Mich.; and, provision for the receipt from other carriers at Cushing of natural-gas liquids from gasoline plants in South Oklahoma.

Conversion

The tight-line conversion of the Cushing-East Chicago segment involved separation of the two interconnected parallel lines from Sheldon, Mo., to Wilmington, Ill., and some load rebalancing. The idle electric-centrifugal stations were revised for automatic (manual start), unattended operation (except for one man in daytime), and additional units were installed, with separate manifolding, for handling the mixed stream.

Three of the original primary stations were kept in operation, one being entirely bypassed by the tight line, and the other two (Cushing and Sheldon, both with diesel-driven reciprocating pumps) having manifolding and equipment separated from the crude system. Also, additional pumping units were installed at these two stations.

The revised tight-line section was placed in operation in December 1957 using two diesel-reciprocating pump stations and eight electric-centrifugal stations, with a nominal capacity of 57,000 bbl. per day at 850 psi.

Operation

The operation is tight line and, as presently set up, is a coordinated, synchronized, continuous movement from origin to destination.

Beginning at gasoline plants in southern Oklahoma, varying mixtures of propane, butane, and natural gasoline move through the feeder lines to seven metered injection points on the 6-in. connecting carrier line to Cushing. This mixed stream is metered directly into the suction manifold or reciprocating booster pumps, which discharge into the 12-in. main line going north.

Other reciprocating units at Cushing pump several grades of crude, and occasionally, varying quantities of middle distillates and heavy-end products, in volume sufficient to maintain a rate of flow for the current total requirements. Mixing occurs on the discharge side of the station. Occasional injections of crude mixed with natural-gas liquids are made at Sheldon at the direction of the shipper.

The composite stream of the 12-in. line is metered to the refiner and fed continuously by the refiner through a spheroid surge tank directly into the refining process.

Propane is received from refiners in the East Chicago area for delivery to shippers' terminals along the line and at the line's terminus at Lowell, Mich. The operation of the 6-in. line follows more or less normal routine of a conventional products system.

First movements through the complete tight-line system began at somewhat lower than nominal capacity rate to permit necessary adjustments and synchronization of plant facilities.

The initial mixtures from the feeder lines to Cushing consisted of crude, 26-lb. natural gasoline, propane, and

Table 1—Typical operations for 16-day

(In barrels

Components		*Kansas	Hewitt	Okla.	W. T. sweet	Velma sour	Total crude
R.v.p.		3.5	4.5	9.3	10.6	3.8	....
Gravity		35.0	34.0	39.0	41.0-47.0	29.0	....
Dec.	23	1,545	15,189	16,808	....	....	33,542
	24	970	15,578	16,201	....	....	32,749
	25	2,210	15,633	16,613	....	....	34,456
	26	1,618	15,263	8,308	5,728	....	30,917
	27	1,316	15,036	....	14,192	....	30,544
	28	1,626	15,122	....	15,585	....	32,333
	29	39	11,047	....	20,835	....	31,921
	30	....	13,062	....	18,217	....	31,279
	31	....	12,005	....	20,744	....	32,749
Jan.	1	....	11,912	....	16,986	4,485	33,293
	2	....	11,421	....	17,108	4,952	33,481
	3	....	10,210	....	18,512	4,865	33,587
	4	....	10,284	....	18,347	4,982	33,613
	5	....	10,522	....	18,291	4,808	33,621
	6	....	10,116	....	22,254	1,472	33,842
	7	....	11,952	....	22,381	....	34,333

*Kansas crude injected at Sheldon contained 8% butane mixture under atmospheric

out which can be put into use to aid in energy conservation."

butane, totaling an average of 9,400 bbl. per day. The proportions of the mixture averaged 32% crude, 23% natural gasoline, 11% butane, and 34% propane. The percentage ratio varied considerably from hour to hour, and the vapor pressure ranged from 60 to 99 psi. with viscosity in the range of 36 to 40 S.s.U.

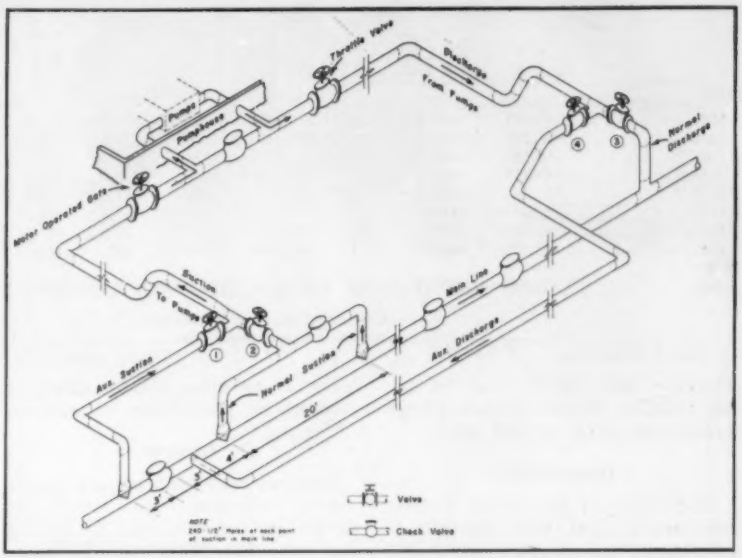
At Cushing, sufficient crude was injected to bring the total volume up to 48,000 bbl. per day. The resultant vapor pressure of the final mixture ranged from 30 to 50 psi.

The crude component of the mixture from the feeder system was discontinued after a short period, and since that time the volume arriving at Cushing has been only the lighter products. This volume has ranged from 9,000 to 13,000 bbl. per day, with vapor pressures ranging up to 113 psi.

The crude injections at Cushing during an 8-month period consisted of varying quantities of five different grades, with API gravities ranging from 29 to 47.

During this period, the daily average pumpings out of Cushing ranged from 48,000 to 51,000 bbl. per day. The composite mixture was thus proportioned approximately 20 to 30% light hydrocarbons and 70 to 80% crude with API gravity from 42 to 55°, and vapor pressure from 24 to 50 psi.

Since October 1958, intermittent quantities of No. 1 fuel oil and residuum have been injected into the main line at Cushing along with the crudes. These middle distillates and heavy-end products were received through a connecting carrier either as straight fuel oil or as a mixture of No. 1 fuel oil and residual stock, in the ratio of 30% residuum and 70% fuel, around 32° API gravity, and 60 S.s.U. viscosity at 100° F. (See Table 1.)



AUTOMATIC PIG BYPASS permits pig to pass without attendant or station shutdown. In normal operation, valves 1, 2, and 3 are open, valve 4 is closed. After scraper arrives, valve 1 is closed to be sure scraper passes through first 12-in. check valve in main line, then valve 1 is opened, valve 2 closed, valve 4 opened, and valve 3 closed completely. After scraper passes outgoing pig sig, valve 3 is opened, valve 4 closed, valve 2 opened, and valve 1 is left completely open. Fig. 2.

The first shipment of No. 1 fuel and residuum arriving at Cushing through the connecting carrier products line was preceded and followed by straight fuel buffers to reduce or prevent contamination of other products, and all was further blended in tankage by the use of tank mixers before injecting into the main stream. However, there was some color contamination in the product following the residuum mix.

Movement of a possible 50/50 mixture of No. 1 fuel and residual stock to Cushing on a regular long-time basis is under study.

Mixing

As presently set up, there is no exact control over the methods or proportions of the mixture of the natural-gas liquids arriving from the feeder lines through the connecting carrier to Cushing.

The quantity and proportions vary considerably and frequently, because feeder-line injecting stations at the plants operate on an irregular basis, being affected by local conditions such as truck and tank-car loadings and other factors which affect stock situations at the gasoline plants.

During the first 9 months of tight-line operation, three of the several grades of crude as received at Cushing were mixed in tankage on a percentage basis to provide a more uniform stream for injection along with the lighter hydrocarbons. This procedure proved to be burdensome due to the number of tanks, tank changes, and gage tickets involved, along with scheduling problems involving delivering carriers.

This problem was considerably alleviated by feeding the desired proportions of the different crudes from the

period, December 1958-January 1959

per day)

26 lb. gaso.	Butane	Propane	Total NGL	No. 1 fuel & residuum	Total mix	R.v.p.	Per cent Crude	Per cent NGL	Per cent Fuel
....	....	....	65.8-89.6			....	....	....	....
....	....	....	....	37.1	51.9-45.5	....	....	....	....
5,225	2,847	1,794	9,866	3,172	46,580	31.1	72	21	7
4,722	2,396	2,552	9,670	3,872	46,291	29.6	71	21	8
4,640	2,436	2,740	9,816	3,347	47,619	33.3	72	21	7
6,474	2,731	2,201	11,406	3,959	46,282	31.8	67	25	8
5,058	2,324	2,820	10,202	4,426	45,172	38.6	68	22	10
5,276	2,400	3,515	11,191	4,048	47,572	35.2	70	23	7
5,989	2,111	3,320	10,420	4,108	46,449	35.2	67	24	9
5,658	2,187	3,083	10,928	4,164	46,371	38.2	67	24	9
4,405	2,053	3,039	9,497	4,165	46,411	38.2	71	20	9
5,047	1,933	3,509	10,489	4,166	47,948	38.2	70	21	9
5,376	1,769	3,585	10,730	4,137	48,348	37.3	70	21	9
5,725	1,251	3,554	10,530	4,369	48,486	36.7	70	21	9
5,162	2,187	3,329	10,678	4,196	48,487	34.1	70	21	9
6,576	1,445	2,939	10,960	4,224	48,805	33.4	70	21	9
5,629	2,075	3,372	11,076	3,934	48,852	37.6	70	21	9
5,876	1,232	3,489	10,597	3,801	48,731	35.7	71	21	8

pressure.

TABLE 2—APPARENT SHRINKAGE LIGHT HYDROCARBON/CRUDE MIXTURES
(9-Month Period)

	Bbl. crude rec'd.	Pump out factor	Pump out loss (bbl.)	Bbl. NGL rec'd.	NGL as % of total	Approx. crude gty.	Approx. NGL gty.	Shrinkage factor	Barrels shrinkage	Total calc. loss	Actual (shortage)	Shortage as % of NGL
1958												
May	1,144,687	.0001T	114	235,565	17.1%	37.2	100.5	2.5%	5,889	6,003	(2,622)	(1.11)
June	1,090,568	.0001T	109	240,417	18.1	37.6	95.6	2.1	5,049	5,158	(2,842)	(1.18)
July	1,113,886	.0001T	111	275,935	19.9	37.9	104.3	2.7	7,450	7,561	(7,127)	(2.58)
Aug.	1,147,319	.0001T	115	279,709	20.6	38.0	103.8	2.6	7,740	7,855	2,864	(3.54)
Sept.	520,244	.0001T	52	146,039	21.9	37.0	110.8	3.2	4,673	4,725	(2,959)	(2.03)
Oct.	969,035	.0001T	97	295,989	23.4	37.2	112.0	3.2	9,472	9,569	(4,485)	(1.52)
Nov.	1,082,965	.0001T	108	289,100	21.1	37.2	107.1	2.9	8,384	8,492	(7,035)	(2.43)
Dec.	1,108,033	.0001T	111	302,206	21.4	37.2	106.3	2.9	8,764	8,875	(3,403)	(1.13)
1959												
Jan.	1,125,679	.0001T	113	350,466	23.7	37.2	106.7	2.8	9,813	9,926	(6,619)	(1.89)

Calculated wt. avg. shrinkage 2.8%
Actual average shrinkage 1.9%

respective tanks directly into the suction manifold of the injection pumps through throttling of tank gates.

Dispatching

Dispatching of this system involves considerable detail with reference to scheduling, coordination, synchronization, and operations.

Volume fluctuations from the gasoline plants require frequent adjustments of the crude stream injected at Cushing to keep the main-line throughput volume uniform. The connecting carrier advises of these variations as they occur.

Nonuniformity of the light-hydrocarbon proportions received at Cushing, and the variable gravity and viscosity of the resultant mixture, cause large variations in pressures in the main-line sections, and requires very close monitoring at the separation plant on the delivery end. Volume of throughput may vary as much as 2,000 to 3,000 bbl. per day, and could result in excessive power cost.

Some 28 different pumping combinations have been worked out, which can quickly be put into use to aid in energy conservation.

Over-all scheduling information in the hands of the dispatching group and the refinery indicates the planned relative volumes of light hydrocarbons and crudes, but does not take care of daily or hourly variations.

In order that the refinery may exercise close control of processing, it is necessary to have as much advance information as possible covering characteristics of the composite mixture.

Transit time from Cushing to East Chicago is normally around 11 days. Consequently, the refinery is advised 7 days in advance of arrival the general proportions, gravity, and vapor pressure of the daily delivery. In addition, gravity indication is continuously telemetered from the last upstream station, 54 miles or approximately 24 hours away. This continuous chart, with time-lag calculations, enables the plant operators to more closely anticipate variation in proportions of mixture.

Scrapers

Scrapers have been run on regular weekly schedules. The lengths of scraper sections, beginning at Cushing, are 187, 157, 277, and 54 miles. Scrapers are bypassed at six of the intermediate stations.

At the beginning of tight-line operation, larger than usual amounts of paraffin were removed at each of the four scraper traps. This condition prevailed for 4 to 6 months, when the quantities gradually decreased progressively from the initial station. At the end of 10 months, the deposits in scraper traps and strainers were very small, and by February 1959 practically no measurable quantities were in evidence.

This indicates that the light hydrocarbons had a rather slow solvent action on the higher-melting-point, tightly adhering waxes, in a line that had been in crude service some 30 years.

This same cycle occurred on the 120-mile 6-in. connecting carrier, which also had many previous years of crude service. However, clearance occurred much more rapidly, with nothing but the light hydrocarbons in the line. But, after being cleared of encrustations or wax deposits, this line immediately began to suffer from rapidly increasing internal corrosion.

First evidence was large flakes of mill scale, then finely divided rouge, in large and rapidly increasing volume, typical of uninhibited products-line experience. Inhibitor injection on the feeder system soon remedied this situation.

In the earlier stages of tight-line operation, bypassing of scrapers at intermediate stations resulted in much inconvenience and confusion. Procedure required that an operator be present to shut the station down, then get back on line after passage. This required pressure adjustments at other stations, and resulted in pressure surges, extra labor costs, and loss of throughput.

To correct this situation, a relatively simple arrangement was devised which permitted scraper passage without shutting down, and with no pressure surges, or adjustments at other stations, or loss of throughput This was accomplished through minor changes and additions in the existing manifolds, whereby the scraper comes to rest after passing the station suction line. It can then be sent on its way at any time an operator is on duty by simple manifold-valve manipulation. (Fig. 2).

The light-hydrocarbon components of this system go tight line all the way from metered receiving point to metered delivery point, thus are not subjected to usual working-tank vapor losses.

The crude component injected at Cushing is made up of West Texas Sweet, Scurry, Hewitt, Golden Trend, Oklahoma Sour, and occasional fuel and residuum. Kansas crude and gasoline/crude injections are made intermittently at Sheldon.

The crude components are injected from tanks on the down gage only, and the entire composite stream is metered at delivery point.

Over a 9-month period the calculated average shrinkage loss was considerably less than the values indicated on certain published curves developed from laboratory experimental investigation[1] (See Table 2).

This difference could well be attributed to extrapolation for light-hydrocarbon percentages higher than shown in the experimental curves, and to the complexity of the composite mixture in the pipeline. Also, to the fact that these rough calculations were based on the approximate gravity of the light-hydrocarbon mixture and the approximate gravity of the crude mixture.

Reference

1. Petroleum Engineer, December 1955.

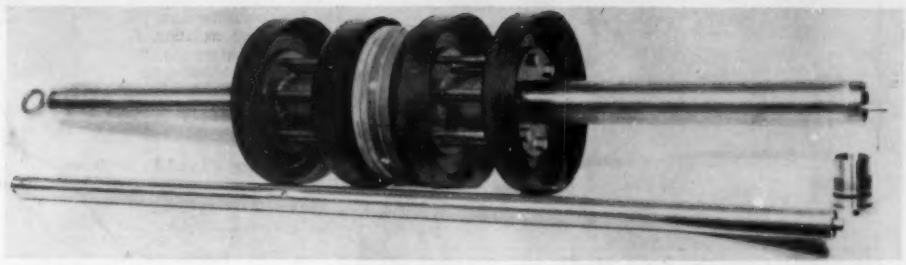


FIG. 1

This educated and instrumented pig, by touring your line . . .

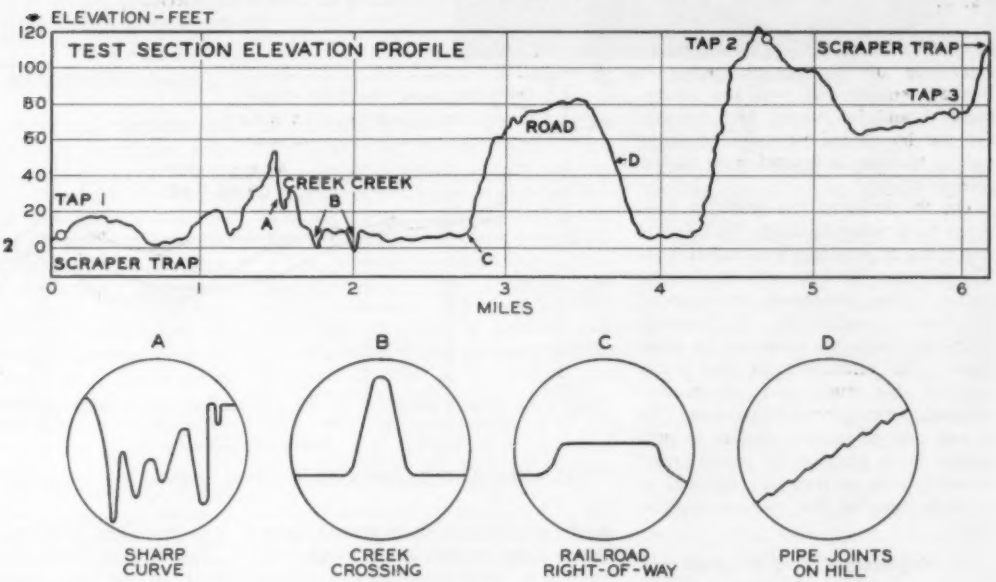


FIG. 2

. . . turns up some vital facts to aid in operations. Here's proof that . . .

You can take a pipeline's pulse internally

BY HOWARD J. ENDEAN
Head of Fluid Segregation and Transportation Section,

ROBERT M. HOWARD
Pipeline Research Group Leader,

AND JAMES E. KNIZNER
Research Engineer,
Gulf Research & Development Co.

ONCE a pipeline system has been placed in service, operating characteristics and condition of the line between terminals cannot readily be determined. While external testing and inspection are possible, except for unusual problems, the cost of such procedures usually precludes their use. If inexpensive methods could be developed for continuous internal surveying of pipelines to determine operating characteristics and pipe conditions, operating procedures could be improved.

In cooperation with our pipeline divisions, a study was made to determine the feasibility of conducting internal surveys in pipelines. The investigation indicated that surveys could probably be made for a number of operating and maintenance factors. The study disclosed a variety of measuring procedures that were readily adaptable for continuous recording while the instruments are pumped through a pipeline. A few of the measurable variables that could be recorded were grade, curvature, roughness, pressure, temperature, leakage, and possibly electrical potential.

The possibility of modifying pipeline operating conditions for surveys was considered. It was concluded that to be generally acceptable, surveys should require no special conditions as to either delivery rate or equipment between terminals. It was agreed minor modifications of terminal equipment would be feasible; i.e., scraper traps, piping bypasses, etc.

The basic design criteria established were that a survey instrument should

Paper presented at annual pipeline conference, API Division of Transportation, Pittsburgh, May 13-15, under the original title, "A Study of Continuous Pressure Traverse in Pipelines."

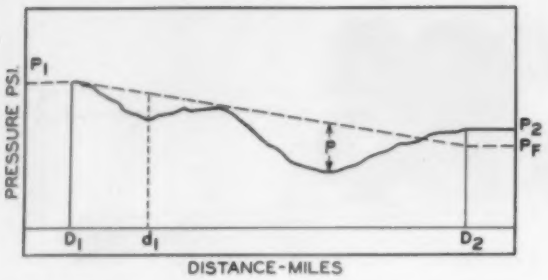


CHART READING PROCEDURE for elevation determination. Fig. 3.

LEGEND

P_1 = initial pressure, psi.
P_2 = final pressure, psi.
P_H = pressure equiv. of elevation difference, psi.
H_1 = initial elevation, ft.
H_2 = final elevation, ft.
p = feet elevation/psi.
p = pressure equivalent of any elevation, psi.
h = elevation equivalent of p, ft.
$P_H = (H_1 \pm H_2)/p$
$P_F = P_2 \pm P_H$
P_F = final pressure, psi.

Note: Sign of H determined by relations of elevation at D_1 and D_2. With higher elevation sign is (−).

Connect P_1 and P_F as shown.

Measure pressure equivalents of elevations p at intervals required from D_1 to D_2.

$$h = p/p$$

Elevation at $d_1 = H_1 \pm \Sigma (h_1 + h_2 + \ldots + h_d)$

Note: $(h_1 + h_2 + \ldots)$ represents elevations calculated between D_1 and d_1 for constructing intervening profile.

have dimensional and operating characteristics of pipeline scrapers. A further requirement was the equipment should be rugged and suitable for use by skilled personnel without special training in operation or record interpretation.

On the basis of the study, a program to develop methods for internal surveying of pipelines was undertaken. The program has been of a continuous nature. One completed development has been a method for continuously recording pressure traverses in pipelines. The remainder of this paper reviews this study and information obtained from pressure traverses. This is but one of several studies in progress. It is planned to report other investigations as they are reduced to a form suitable for routine application.

Exploratory Test Program

The preliminary study indicated a variety of surveys were theoretically possible. However, it was recognized that pumping instrumentation through a pipeline presented problems not encountered in normal instrument application. For this reason initial emphasis was directed toward an exploratory program to determine the severity and variety of operating conditions that would be encountered.

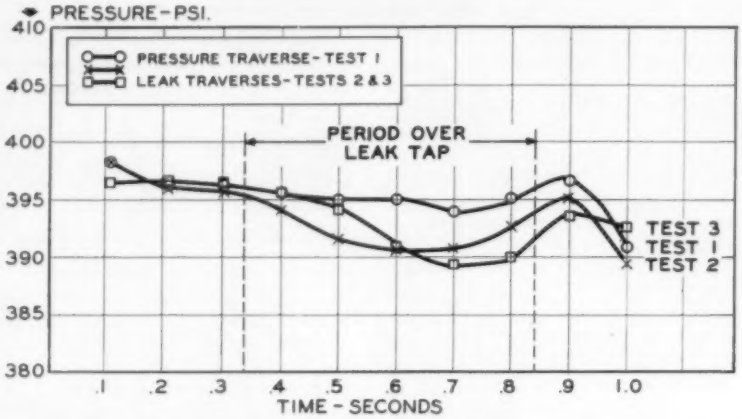
Pressure traverse recording . . . It was decided the first study would be on continuous recording of pressure traverses in a pipeline. While pressure variations were not considered of primary importance, background experience from bottom-hole-pressure surveys in oil wells indicated this recording could be made in pipeline operations. Another factor influencing the decision was the availability of rugged, accurate pressure gages adaptable to pipeline tests without major modification.

To expedite the program and assure realistic conditions, exploratory tests were made in a crude-oil pipeline operating on a routine basis. Limiting dimensions for the test instrument were a maximum diameter consistent with an 8-in. pipeline and a length suitable for navigating a 22½° long-radius tube turn.

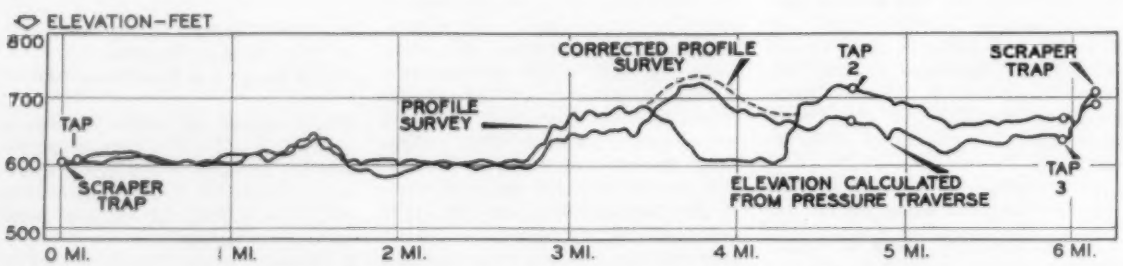
Fig. 1 shows the instrument used in the initial tests. In the foreground is a modified 1,000-psi. bottom-hole-pressure gage inserted in the tubular body of the pig arrangement. Pressure ports were arranged so that pressure recording could be from the front of the assembly, between the center cups, or from behind the rear cup, depending on the purpose of the test.

In order to expedite the program, at one test section a receiving trap was installed approximately 6 miles from the pump station to permit short test runs to study instrument behavior and record interpretation procedures.

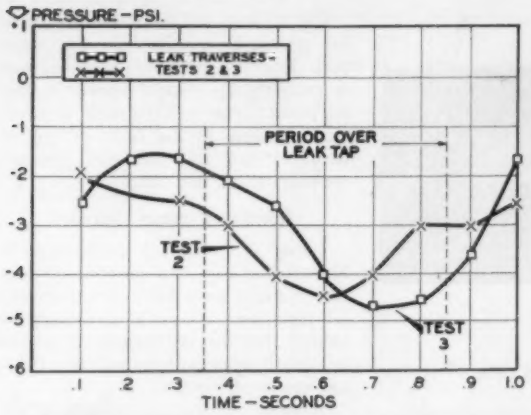
The upper half of Fig. 2 is the profile of this 6-mile section. At the circled points on the profile, designated as taps 1, 2, and 3, simulated leaks were created. These leak taps were opened during the period the



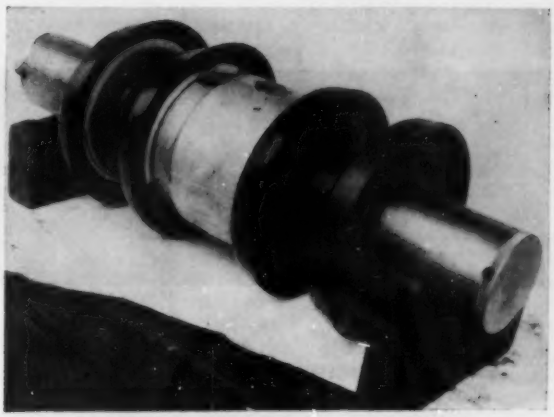
MEASURED AND CALCULATED elevation profiles are compared. Fig. 4.



PRESSURE AND LEAK traverse response is shown at leak tap 3. Fig. 5.



PRESSURE DIFFERENTIAL at leaks, tap 3. Fig. 6.



PRESSURE RECORDING pipeline pig. Fig. 7.

pressure recorder was passing the taps to determine whether significant pressure anomalies could be detected. Also indicated along the profile are a number of typical line right-of-way obstructions that required a marked grade or direction change in the pipe.

At each of the locations indicated, a pressure anomaly was observed. Typical examples of pressure recordings are illustrated in the inserts on the lower half of Fig. 2. The form of recording would generally vary, depending on rate of travel, tightness of cups, and location of pressure inlet on the instrument.

Insert A illustrates a sharp curve. The pressure surges represent velocity changes of the instrument and accompanying pressure changes as cup friction varied.

Insert B is a typical creek or gully-crossing type of recording, the marked grade change causing a rapid pressure fluctuation as the instrument moved through the area. Insert C illustrates the type of recording frequently associated with railroad or road crossings. A marked pressure increase occurs as elevation is lowered, followed by a short interval of constant pressure, and a decrease of pressure as the line returns to normal grade.

Insert D shows a type of recording over the test section where a rapid change of grade occurred for a considerable distance. This line had bell and spigot-type joints. Chill rings slightly reduced the inside diameter at each joint. With the instrument pressure inlet located between tight-fitting seal cups, pressure on the instrument was relatively constant between joints.

When the instrument passed over a chill ring, the seal of the cups with the pipe wall was broken, reestablishing pressure in the instrument. This caused the pressure to increase or decrease stepwise as the pig ascended or descended an elevation change.

Interpreting pressure record . . . Interpretation of the data proved that with known constant delivery pressure and elevation at ends of the test section, the pressure record could be interpreted to give an elevation profile.

The method of interpreting a pressure traverse in terms of pipeline elevation is shown in Fig. 3. The idealized chart illustrates a pressure record of a traverse of a pipeline between locations D_1 and D_2. P_1 and P_2 and H_1 and H_2 are pressures and elevations at the beginning and end of the traverse. This difference in elevation at H_1 and H_2 is converted to pressure P_H.

P_F is obtained by correcting P_2 for difference in elevation by the addition or subtraction of P_H, depending on whether D_2 is at a lower or higher elevation than D_1. Pressures P_1 and P_F are then connected by a straight line as shown by the dashed line of Fig. 3.

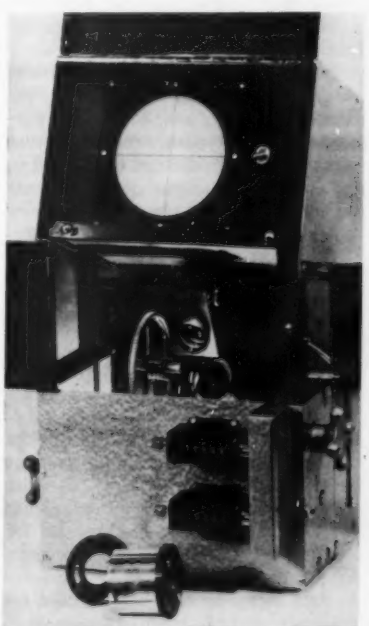
The uniform pressure drop illustrated by the dashed line represents the energy loss that would have occurred if there had been no change of elevation in the pipeline. The pressure equivalent of changes in elevation is the difference between dashed line and recorded pressure traverse illustrated as p on the figure. These pressure differences, when measured and converted to feet equivalents, are used to construct a line profile survey.

Fig. 4 compares the measured elevation profile with the conversion of pressures in the test section to an elevation profile. At Milepost 4, it will be noted that the calculated elevation shows the line crossing a hill, while the surveyed profile shows the line in a valley.

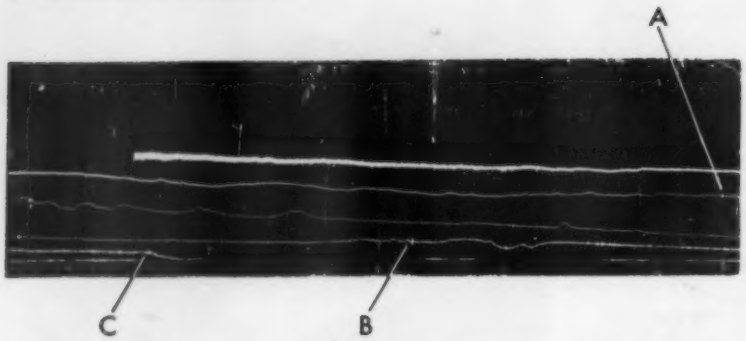
At the time of interpretation, this difference could not be explained; however, later it was found the elevation calculated represented the true line profile since the map had not been corrected for a relocation of the line. The resurvey of the line is indicated by the dotted portion of the profile.

It will be observed that while the calculated elevations generally follow elevation changes of the land survey, there is a cumulative error. The reason closer agreement was not obtained is due to interpretation not being planned at the time of the test.

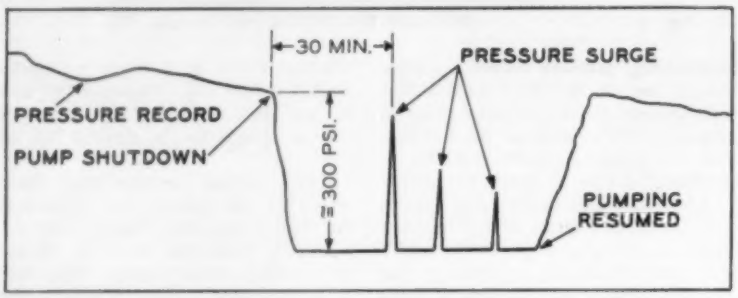
This necessitated the assumption that pressure of the line remained constant during time of survey and required estimating other factors used in calculations. As illustrated later where pressures are maintained constant and necessary data recorded, a close approximation of elevation profile can be obtained from a pressure traverse.



PROJECTION-TYPE chart viewer magnifies record. Fig. 8.



STANDARD PRESSURE TRAVERSE of 60 miles is illustrated. Fig. 9.



PRESSURE RESPONSE during line shutdown at mid-point of line section. Fig. 10.

Detecting leaks . . . The leak tap locations on Fig. 2 were used in the preliminary test program to determine if a sufficient pressure drop would be created by a leak to record on a pressure-traverse survey. As was anticipated with pressure recording from in front or behind the drive cups of the instrument, no interpretable indication was obtained.

Leakage rates were in the range of 5 to 10 bbl. per hour. However, while the pressure recorder was bridging the leak tap, detectable pressure drops were created. This is attributable to a partial seal created by the cups. The seal will persist until a sufficient differential pressure is created to deflect the cup and destroy the seal.

The anomalies, while detectable by careful record interpretation, were small. Actual differentials were of the order of 2 to 5 psi. The anomalies persisted only during the period the leak was bridged, which varied from 0.25 to 0.50 sec.

Pressures recorded during a standard pressure traverse and two leak traverses at leak tap 3 are shown on Fig. 5. As shown in test 1 when the tap was closed, the pressure remained essentially constant during the period. However, in tests 2 and 3 a pressure drop of approximately 5 psi. occurred during the period the instrument straddled the leak. Fig. 6 illustrates the differential pressure between measured pressure traverse and the leak traverses during the time the drive cups were bridging the leak tap.

It was obvious leak anomalies would not exhibit a distinctive form that could be assoicated only with leaks. However, the anomalies did establish that sufficient energy could be developed to operate instrumentation which might serve for leak detection.

The tests over the 6-mile section and several tests with the exploratory instrument over 60 to 80-mile intervals between terminals proved the pressure element of the instrument would be suitable for routine pressure surveys. The instrument illustrated in Fig. 7 was developed and has been used for conducting routine pressure-traverse surveys.

As shown, the pressure element is mounted to 8-in. diameter cups. However, with minor modifications of cup-mounting flanges, the element is applicable for pipe sizes up to 14 in. Above this diameter, certain major modifications will be required in pig body elements.

While it was obvious in design studies that a variety of chart-rotating arrangements could be used, all work to date has been with clock-driven units. This has been dictated by the availability of accurate, rugged, high-torque clock motors. Test experience to date indicates time can be used for determining instrument location with sufficient accuracy for most liquid-pipeline applications.

Fig. 8 illustrates the instrument used for pressure-gage record interpretation. This is a projection-type system magnifying the record approximately 10 times. The two counter arrangements shown on the front of the instrument register time and pressure coordinates of the chart.

Routine Pressure Surveys

Using the standard instrument illustrated in Fig. 7, a number of pressure surveys have been run in crude-oil pipelines. There is no reason to believe that the instrument would not be equally applicable to product, LPG, and gas pipelines.

A standard pressure traverse of approximately 60 miles is illustrated in Fig. 9. The broad recording at the beginning of the test is due to surge action produced by reciprocating pumps. Where precise recording is necessary, these surges could be controlled by desurging equipment.

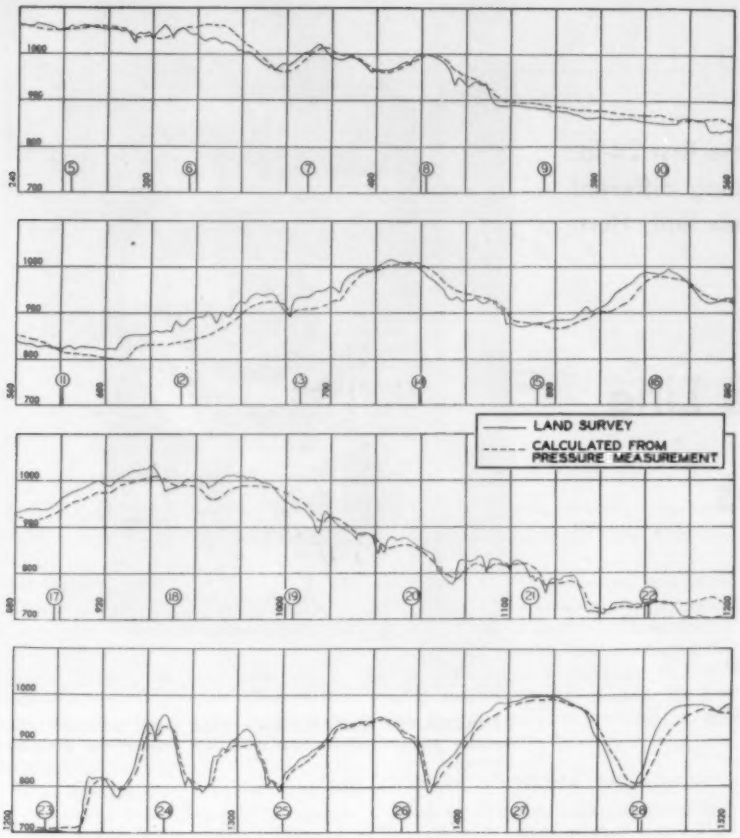
In systems using centrifugal pumps, no significant surge action is observed. The wavy response illustrates elevation changes of the line, with the sections concave upward being associated with valleys. The pressure "pip" indicated at point A on the chart is located at a line repair.

Discussions with personnel indicated this was the approximate location where, in a leak emergency, the drift-pin welding procedure had possibly been used. This was partially verified by a deep gouge along the instrument body at the end of the run. The anomaly indicated at B occurred at a check valve and the response at C is associated with a creek crossing.

In a subsequent test over this section, the routine line-shutdown procedure was performed. The procedure is to allow approximately 30 minutes of drainage after stopping pumps at the delivery station before closing in the system. When the pressure-recording pig reached approximately the mid-point of the traverse, this procedure was followed.

Inspection of the chart record showed the pressure within the line dropped essentially to zero at the time the pumps were stopped. The pressure remained at zero until the valve was closed at the end of the drainage period. Shortly after closing the valve, a large pressure surge was recorded by the instrument. This behavior is illustrated on Fig. 10.

The surge was slightly less than line pressure immediately prior to shutdown. It is possible if the valve had been closed immediately after pump shutdown and a surge of the same magnitude imposed on the operating pressure, maximum working pressure of the system would have been ex-



SURVEYED AND CALCULATED elevation profiles are compared. Fig. 11.

ceeded. As would be anticipated, a number of smaller surges were also noted as shown on the illustration.

In general, surveys in other pipeline sections exhibit the same type of anomalies noted in this survey. With the exception of the anomaly associated with the leakage repair noted above, pressure response in a traverse can usually be assoicated with items noted on the strip maps.

In one of the tests conducted on the traverse shown in Fig. 9, operating pressure was carefully controlled and data necessary for calculating elevations recorded. Fig. 11 illustrates correlation between the standard survey and the profile calculated from the pressure record. This comparison covers approximately 25 miles of line.

No attempt was made in calculating to detail small elevation changes. A careful study of pressure surveys where a line crosses rivers or rough terrain has indicated that an accurate elevation profile calculated from pressure would probably more closely approximate a pipe profile than a standard elevation survey.

In one test in a line where delivery was with reciprocating pumps, an unusual surge condition was observed that could be of significance. The type of surge action shown in Fig. 9 at the beginning of the test run was present. However, even after initial surging had been dampened, periods of surge action occurred at locations farther down the line.

In several instances magnitude of surges equaled those recorded at the beginning of the survey. It is possible these could be associated with pistons of the pumping units becoming periodically synchronized. Further investigations will be required to definitely establish the cause of this anomaly.

This phase of our research program is completed. The equipment developed for conducting pressure traverses is adequate both from the standpoint of ruggedness and accuracy. While few pressure anomalies have been recorded that could not be associated with either operating conditions or pipe configuration, as experience is developed in interpretation we can anticipate that the cause of these anomalies will be determined.

Results and Future Studies

Experiences in development and testing of pressure-recording instruments indicate that conducting internal surveys in pipelines is practicable. The investigations further indicate that methods and equipment for pressure, temperature, and leak recording will probably be simple and rugged. The program has also indicated that no special operating procedures or training will be required in conducting or interpreting these surveys.

Further study indicates instrumentation for surveying such items as electrical potential, internal roughness, and corrosion pitting will require electronic-type circuitry. Such surveys may also require special operating conditions. Where the surveys require close interpretation of recording for pipe condition, the analyses of records will be time-consuming and expensive.

It is conceivable that equipment could be developed for automatic-recording interpretation to expedite such investigations. Such equipment would be expensive and suggests that the most satisfactory arrangement for such studies would be by industry-wide service organizations.

This would minimize the special survey instruments, interpretation equipment, and trained personnel required for the more complex-type survey. With the contractual-type procedure, it would be anticipated that the expensive instrumentation would have a rapid payout and reduce the costs of surveys to a reasonable figure.

While the exploratory program covered in this discussion was conducted in operating pipelines, this procedure was not considered practicable for a continuing program. Of necessity, the tests through sections between terminals are time-consuming. Also, the frequent instrument changes during an exploratory study cannot be efficiently performed in field operations.

In order to expedite our program, a 500-ft. 8-in. test loop was constructed at Gulf Research Center. In this loop it is possible to duplicate practically all operating conditions encountered in field operations. The present procedure in investigations is to reduce the development to a form suitable for routine operations in the research loop, then confirm laboratory findings by field testing under routine operating conditions.

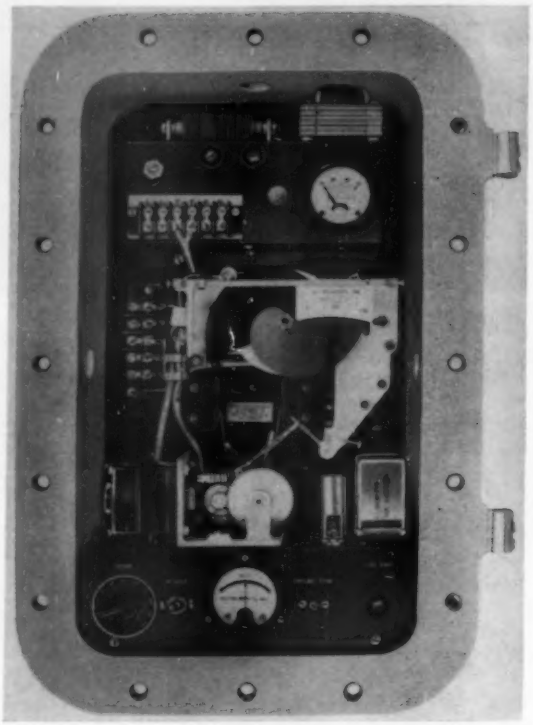
Acknowledgment

The authors express their appreciation to Gulf Research & Development Co. for permission to present this paper. Special thanks are extended to J. L. Irvin, P. L. Reichard, and J. D. Jones, of Gulf Refining Co., for their valuable cooperation in the field-test programs. The authors also acknowledge the valuable assistance of N. Marusov and E. A. Olzewski in the laboratory and field-test programs.

One of the problems faced in the first 24-in. products pipeline was shipping different product grades through the same line. Here is a report on . . .

How Laurel Pipe Line moves 16 grades of products

BY JAMES F. STEPHENSON
Station Construction Superintendent,
AND MARLAN G. JORDAN
Chief Engineer,
Laurel Pipe Line Co.



CAPACITANCE PRODUCT ANALYZER gives accurate information about batch interfaces by measuring dielectric strength.

THE Laurel Pipe Line System is a petroleum-products pipeline extending from the Philadelphia area to Cleveland. Supply for the system is taken from refineries into Booth station and tank farm for further distribution.

The 16 grades of products are delivered from refineries to Booth storage into 9 gasoline tanks and 8 distillate tanks. Products received at Booth are sized into separate batches or blocks in accordance with the demand created by the 15 sales terminals and 2 other carriers in Pennsylvania, and 4 sales terminals and 1 other carrier in Ohio.

Products are pumped from a manned automatic station at Booth through 107 miles of 24-in. pipeline to a manned automatic booster station at Mechanicsburg, Pa. From Mechanicsburg station the product is pumped through 77 miles of 20-in. line to an unattended remotely controlled booster station at Duncansville, Pa.

Products are further boosted by Duncansville station through 114 miles of 18-in. line into working tanks at a manned station at Aliquippa, Pa. Identity of shippers' products is maintained at Aliquippa. Products accumulated at Aliquippa are rescheduled to supply four sales terminals located at Ellsworth, Atwater, and Cleveland, and to another carrier at Ellsworth for transportation to destination. The 14-in. line between Aliquippa and Cleveland is 107 miles long.

Paper presented at annual pipeline conference, API Division of Transportation, Pittsburgh, May 13-14, under the original title, "Design Features of the Laurel Pipe Line System."

Communications

The objectives of communications for the system are to provide reliable talking circuits between any two points on the system and to provide good-quality circuits for telemetering and supervisory control of the pipeline. Laurel Pipe Line Co. is joint owner of a microwave system between Philadelphia and Aliquippa. Leased facilities are used from Aliquippa to Cleveland.

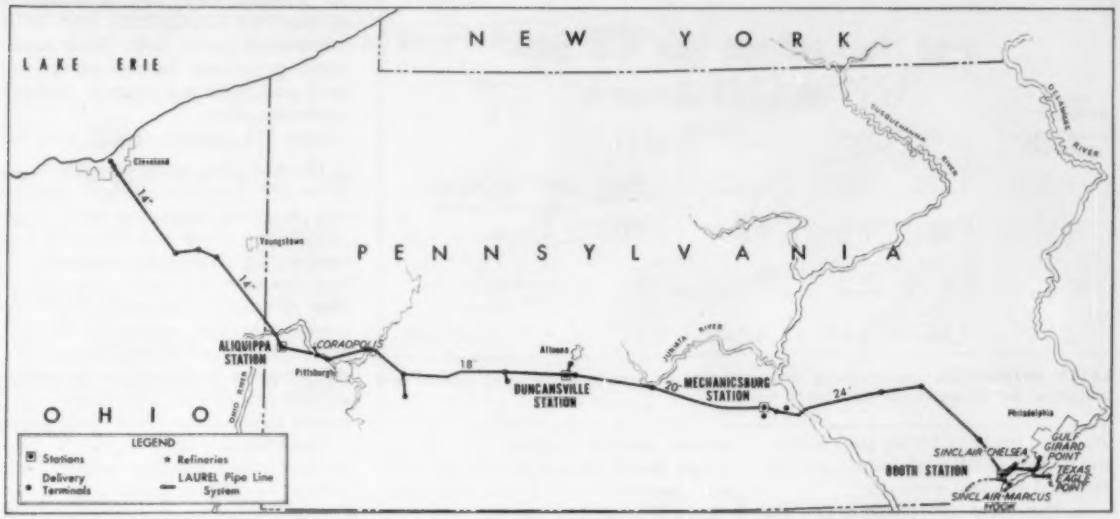
For maintenance and operation purposes a VHF mobile radio system is provided with base control stations at Camp Hill, Mechanicsburg, and Coraopolis, Pa. Through the use of the channel on the microwave system used for VHF mobile radio, personnel may be contacted anywhere on the pipeline system. Six channels east of Camp Hill, and 10 channels west of Camp Hill are currently in service.

The dispatch board for the system and the central console for Duncansville remotely operated booster station are located in the Camp Hill office, near Harrisburg, Pa., which is the center of operations for the system. All intelligence indicated on the dispatch board is logged on an automatic typewriter at any predetermined time interval, or can be logged upon demand.

Intelligence received from the three refinery delivery points includes positive-displacement meter readings and line pressure indicated continuously, and flow rates in barrels per hour are recorded continuously.

Intelligence received from the 18 takeoff metering stations includes positive-displacement-meter readings and main-line pressure, indicated continuously; product analyzer or batch detector and flow rate recorded continuously. From the dispatch board the dispatcher has control and indication of takeoff, and main-line block valves and set point control of flow rates.

When notified that a meter station is ready to receive a delivery, the dispatcher can determine the loca-



MANY GRADES of products move along the 429-mile Laurel pipeline between Philadelphia and Cleveland.

tion of the product to be delivered by means of a batch detector. If the delivery is to be a stripping delivery he opens the takeoff valve. As the takeoff valve opens, from the indication of flow rate and pressure, he can then use the set-point control to raise or lower the flow rate to the selected delivery rate.

The delivery rate can be changed from time to time to adjust to changing line hydraulic conditions. Through the use of this set-point control at the 18 metering stations, it is felt that the maximum line throughput efficiency can be attained at minimum power cost.

From the positive-displacement-meter reading displayed by Nixie tubes on the board the dispatcher can determine when the predetermined delivery is completed. The dispatcher can then close the takeoff valve and the deliveryman can pick up the run ticket at his convenience.

Telemetering

The digital telemetering system for the positive-displacement meters is accomplished by a readout counter mechanically coupled to the meter totalizer. The totalizer rotation is converted into electrical form by means of multicontact circuits and will not be lost during a power outage.

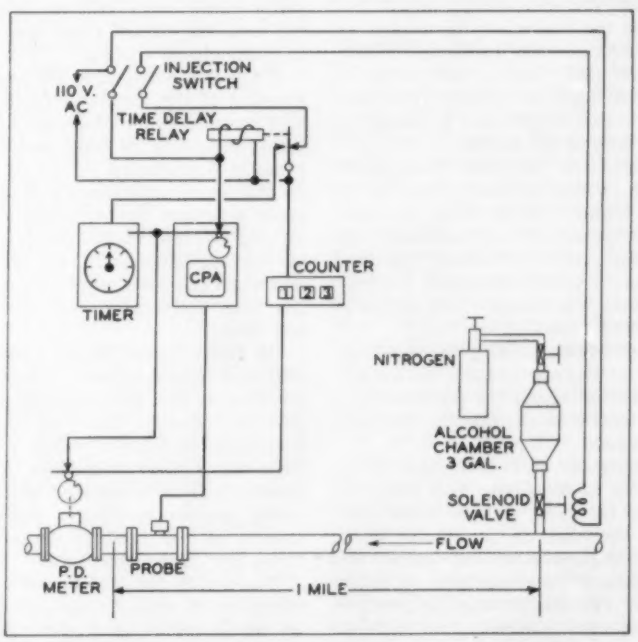
The output of this readout counter is fed into encoding relays where it is converted into five pulse supervisory code. This pulse code is fed into the tone transmitter via microwave to the master station at the Camp Hill office. The pulse code from the tone receiver is fed into the decoding relays where it is converted in suitable form for input to the visual display and to the typewriter.

The flow rates, pressures, and batch detectors are telemetered by the analog or time-duration method. These analog telemetering values are converted by a Giannini disk located on the dispatch board to digital figures and fed into the programer for use in the logging system.

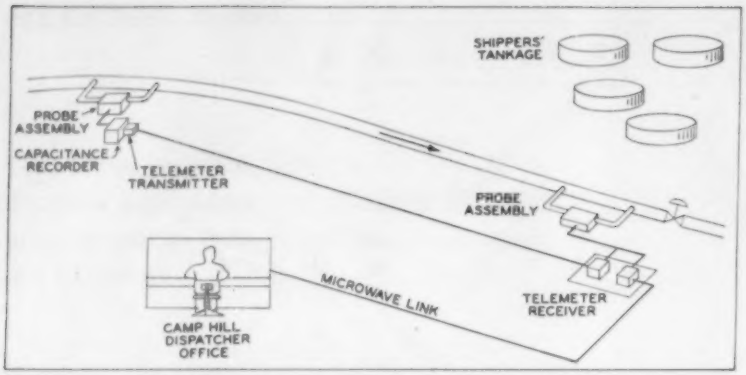
Station Monitoring and Control

The intelligence received from the Duncansville remotely controlled booster station includes station suction and case pressure, outbound-line pressure, and flow rate, recorded continuously. Light indication is received for main and unit circuit breakers, power-company voltage, unit incomplete sequence, position of station valves, low suction and high case pressure, high station discharge pressure, high outbound-line pressure, high and low station flows, and high strainer differential.

These functions could be a transient condition and from the lights indication on the Duncansville console the dispatcher may determine if the trouble is a temporary condition. A channel-test push button, channel-fail-



VOLUME FLOW OF LIQUID is found with this "measured-mile" installation, which verifies the accuracy of positive-displacement meter.



BATCH INTERFACES approaching and arriving at terminal delivery points are indicated by capacitance analyzers.

ure light, ready and reset push button, and system-check push button are also provided for test purposes.

In the event of a station or unit shutdown the station console has lights indicating either mechanical or electrical trouble. A mechanical trouble light indicates that the shutdown was caused by excessive unit vibration, high pump or motor-bearing temperature, pump-seal failure, and pump-case temperature.

A mechanical trouble light without a shutdown would indicate high sump level or low instrument air. An electrical trouble light would entail single phase, station overcurrent, phase balance, high unit motor-winding temperature, and unit motor overcurrent. An electrical trouble light without a shutdown would indicate low tripping battery voltage.

From the dispatching board and console the dispatcher has control of nine station valves, set-point control of flow rate, suction and outbound pressure. An emergency - shutdown push button is provided to completely deenergize the station.

Intelligence received from Booth station includes incoming flow rate on both refinery feeder lines recorded; station suction and outbound-line pressures indicated continuously; outbound positive - displacement-meter readings indicated continuously, and outbound flow rate recorded.

From Mechanicsburg station telemetered intelligence includes station suction and outbound-line pressures indicated continuously, and the flow rate is recorded.

Intelligence from Aliquippa station received at the Camp Hill office includes incoming and outbound flow rates recorded on a circular chart; station suction; outbound line and two hill pressures are indicated by instruments. The positive-displacement-meter readings are displayed on the Nixie tubes.

The dispatch board and remote-station control console are so designed that a green light indicates normal operation and a red light indicates off-normal or trouble. Any time the dispatcher sees a red light he can immediately investigate and take action to correct the condition causing the off-normal operation. All valve indication is by an amber light indicating an open valve and a blue light indicating a closed valve. When both lights are illuminated it indicates that the valve is in the interim position.

Metering Stations

At metering stations the flow rate is controlled by an electrically driven hydraulic controller. The starting circuit of this control valve is governed by the limit switches in the takeoff valve. When the takeoff valve leaves the fully closed position the hydraulic pump motor starts and continues to run until the takeoff valve returns to the fully closed position.

If a pressure exceeding the working pressure of the meters is reached, a high-pressure switch closes the takeoff valve. Indication of high meter-bank pressure is indicated by a red light on the remote supervisory cabinet. All meter totalizers are equipped with a set stop or preset switch which can be set for the amount of the delivery and when this predetermined quantity has been delivered to takeoff valve will close.

On meter banks, where necessary, electrical countershifters have been installed so that the deliveryman can shift the counters from the distribution manifold when a switch is made from one product to another. A continuous sampler is installed at all metering stations so that a composite sample of the product delivered is taken for future reference.

The meters are manifolded so that they may be proved volumetrically or by the master-meter method. Electrical countershifters are installed to aid in the master-meter proving method. Standby emergency generators at all locations automatically start when commercial power fails. These emergency generators furnish power for local and remote operation and for communications.

Sequence Control

The main-line pumping stations are automatic sequence-operated stations with standard protection devices, including pump and motor-bearing high temperature, high pump case-temperature, low suction pressure, high pump-case pressure, pump-seal failure, excessive vibration, motor overcurrent, and high motor-winding temperature. All pressures indicated on the station control consoles are electrically transmitted signals from SR-4 strain gages.

The control rooms are of the pressurized type, housing indoor high-voltage switchgear, motor-control center, and other associated equipment. All tank farms are equipped with pulse-code remote-reading tank-gaging equipment. Automatic standby generators at all stations furnish emergency power for operation of critical valving, lighting, and power for communications equipment.

The booster pumps at Booth station may be started and stopped manually or automatically. When the booster pump control is in the automatic position and the station suction pressure falls below 25 psi., the starting sequence of booster pump No. 1 is energized.

If the pressure output of booster pump No. 1 is not sufficient to meet the desired pressure, or if at any time while booster pump No. 1 is on the line, the pressure falls below this value, then the starting sequence of booster pump No. 2 is energized. When the station suction pressure exceeds 65 psi., the booster pumps are shut down in a manner reversed to that described for starting.

Due to the hydraulic characteristics of the system west of Duncansville station, a back-pressure valve is located on the incoming line at Aliquippa station, which maintains a hydraulic gradient above Laurel or Crescent Mountain, the controlling high points between Duncansville and Aliquippa stations.

To accomplish this a pressure teletax transmitter located near the summit of these mountains will control the back pressure at Aliquippa station to hold the hydraulic gradient above 25 psi. at these control points. If full-stream deliveries are made to either Pittsburgh or Coraopolis metering stations, the electro-hydraulic control valves at these metering facilities are controlled in the same manner as the back-pressure valve at Aliquippa station.

Early pipeliners "played it by ear," but about 40 years ago the industry really got under way with a program of research and development. It learned fast, as told here, and how it applied what it learned is the story of . . .

How U.S. unit pipeline costs have dropped, 1953 to 1957

	1953	1954	1955	1956	1957
Operating Cost (Millions of dollars)	248.6	251.4	263.8	282.8	293.4
Barrel Miles (Billions)	917.1	964.9	1,043.8	1,169.2	1,178.8
Unit Cost (¢/bbl./100 miles)	2.72	2.60	2.52	2.42	2.48
Employes (Thousands, avg.)	26.9	25.7	24.9	24.5	24.3

Figures from ICC

How pipelining got that way

BY M. J. DABNEY
Pipeline Research Coordinator,
Esso Research & Engineering Co.

BY 1920, the pipeline industry was 55 years old and already 52,993 miles of interstate pipelines were in service. This figure consisted of 25,330 miles of trunk lines and 27,663 miles of gathering lines representing an investment of over 340 million dollars by 32 companies.

Most of these lines were built and operated without a very exacting knowledge about the flow of fluids through pipelines. Practically all of the hydraulic fundamentals at the time that would apply to pipeline design were based on water. Pump stations and lines were built with only sketchy specifications, if any, and standards that existed were lacking in the thoroughness that we know today.

Impact of Research and Development

In the years that followed, very rapid changes took place in all phases of pipelining, and these changes were largely due to the results of research and development work carried out by pipeline engineers, manufacturers, contractors, and others associated with the industry.

A great deal of theoretical and experimental work, for example, was carried out in the field of hydraulics to develop the formulas and techniques to cope with fluids with different viscosities, gravities, and other varying characteristics in order that pipeline systems could be accurately designed.

Research work in the hydraulics field has continued with consistent effort up to and including the present with the result that now precise designs can be prepared with complete confidence. Today, this hydraulic know-how and other necessary information can be fed into electronic computers to calculate such things as optimum designs of a pipeline system for a certain set of conditions, gathering system with multiple injection points, feasibility and economic studies, and the like.

Research and development in equipment has caused many basic changes in pipelining. Steam gave way to diesel engines for driving pumps. High-speed engines with gear increasers to drive centrifugal pumps found extensive use and electric-driven centrifugal pumps are very common on both crude and products lines. Very recently, gas-turbine-driven pumps have appeared and are performing well.

The centrifugal pump together with its controls made possible closed-system operation whereby one station pumps directly into the suction of the next without the necessity of tankage. Automatic sequencing on station startup and shutdown, protective devices, control valves, motorized valves, telemetering, and improved communications systems, paved the way for many remote-controlled unattended pumping stations in operation today.

The use of positive-displacement meters saw a very rapid growth from the beginning of World War II. They gained acceptance first on products lines as a means for measuring oil on a custody-transfer basis after demonstrating that they were capable of producing laboratory-type accuracy on large-scale day-to-day operations. Today they are the "cash registers" of the pipelines and are practically as common on crude-oil lines as they are on products lines.

Lease automatic custody transfer is still another of the more recent developments of the pipeline industry which has contributed to increased efficiency and lower-cost operation.

Technology and costs . . . There are many more developments resulting from research and engineering application that we could mention. Corresponding advances have also been made in construction techniques and methods, pipe manufacture, metallurgy, and other associated equipment and tools that the pipeliner uses. How much have all these things helped the industry? Let's see what effect technological advances in the industry have had in contributing to lower-cost operation just within the last few years.

The accompanying figures from Interstate Commerce Commission statistics illustrate this point.

It can be seen that the operating costs have been increasing each year from $248.6 million in 1953 to $293.4 million in 1957. The difference represents an 18% increase. There have also been volume increases of about 28% for the same period. As volume increases have exceeded those of operating costs, the unit costs have therefore shown a downward trend

Paper presented at annual pipeline conference, API Division of Transportation, Pittsburgh, May 13-14, 1959, under original title, "Research and Development in Pipelining."

from 2.72 cents/bbl./100 miles in 1953 to 2.48 cents/bbl./100 miles in 1957, a decrease of some 8.8%.

The increase in the 1957 unit cost was due to a 3.7% rise in operating cost with less than 1% increase in barrel-miles. This small throughput rise was due mostly to the Suez crisis. When the Suez Canal closed in the latter part of 1956, pipelines pumped at capacity or close to capacity rates, with the result that the 1956 throughputs are higher than normal.

During the early part of 1957, the pipelines continued pumping at high rates, but when the canal reopened, throughputs dropped considerably. A demand falloff and an oversupply situation caused the early months' high throughputs to be almost offset by the lower rates for the remainder of the year. As a result, the 1957 volumes showed little increase.

It will also be noted that with the increase in operating costs and barrel-miles, there has been a decrease in the average number of employes by approximately 10%. This reduction in people is due in large part to increased efficiency brought about by the many technical advances made in the industry, as a result of research and development work. These advances have in a large measure counter-balanced the inflationary conditions caused by general wage increases and other rising costs.

Maintenance and repair costs have not varied from 1953, amounting to about 8% of the total operating costs. Better-quality pipe, improved equipment and techniques, better design, and technical advances in coating and cathodic-protection methods have enabled increased volumes to be handled without the full effects of an inflationary period.

Problems for the Future

In order to continue a rapid rate of technical progress, it is, of course, necessary to maintain continued effort in this direction to produce the desired results. For instead of a relatively simple facility to transport oil, the industry has been transformed into a rather complex and precise transportation system which requires a great deal of scientific knowhow and technological ingenuity.

Very often as one problem is solved or an improvement is made, new problems are created which must in turn be solved. As business conditions change, as new products are added, as crude sources change, as user requirements change or become more critical, new problems appear which must have an immediate answer in order for the pipeline to stay competitive. Instead of "catching up," therefore, new research and development work is called for on a continuous and more scientific basis as time goes on.

We have recalled some of the advances that have made certain contributions to the pipeline industry in the past. Now, let's discuss briefly a few problems at random that may warrant some research and development work in the future. Very probably some of the items are already under investigation by companies present and optimum solutions may be forthcoming soon.

Viscous Crudes

A sizable percentage of the world's crude reserves fall into what we might call a heavy or highly viscous category. Viscosities range from the very slightly viscous oils, which present no pumping problems, to the very highly viscous oils, ranging from 10,000 to 500,000 S.U.s. and higher, which definitely do produce pumping problems.

With the large reserves of crudes falling into this category, the day may not be far off when these crudes will have to be produced and transported in large quantities. The production people have research under way at present to develop means for recovering higher percentages of reservoir quantities. When they are able to get these oils to the surface in large volumes, the pipelines will be called on to move this material to refineries and terminals.

With the technical know-how available today, there are several alternate means by which these viscous crudes can be handled by the pipelines and these methods are being used today. But these methods may not be the most economical for the oil to be competitive at the end location. Some of the alternate means of pumping heavy crudes are:

... **Pump as is** where possible.
... **Dilution to pumpable** viscosity.
... **Dilution to lower** viscosity and recycle diluent.
... **Emulsification.**
... **Heat.**
... **Water addition** to form core annulus flow.
... **High-speed conveyor.**

The first five of the methods are reliable means for pumping viscous crudes. The economics of each method, however, varies considerably depending on the individual situation, oil characteristics, quantities to be

Early pipeliners took a fling at research

THE FIRST SUCCESSFUL pipeline was built in 1865 by a man named Martin E. Van Syckel. It ran from a producing field at Pithole, Pa., to the railroad 6 miles away at Miller farm. This pipeline was constructed of 2-in. wrought-iron pipe screw coupled and buried about 2 ft. deep to be below plow depth. Two steam-driven pump stations, operating at about 200 psi., were able to achieve a throughput of 800 bbl. per day.

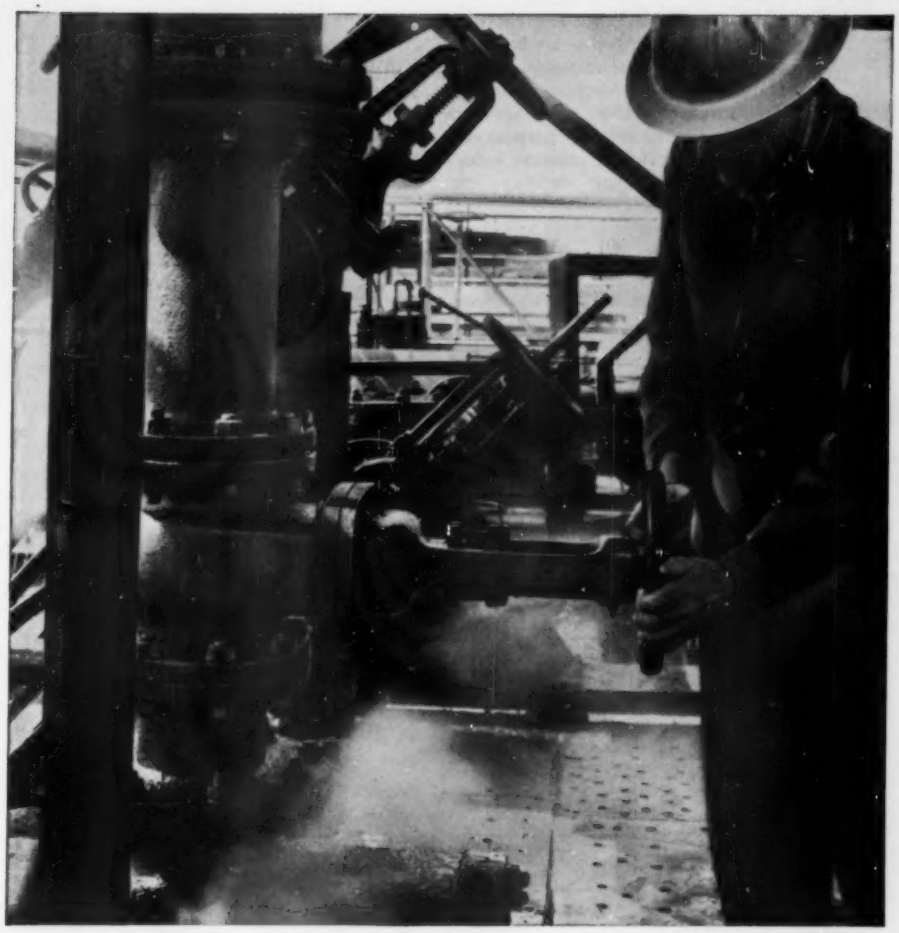
Pipeline technology evolves . . . In view of the change in refining locations, rail rates, and the inherent economy of pipeline transportation, it was only natural that the first long trunk line followed as early as 1879. Tide Water Pipe Co. planned and built a pipeline 6 in. in diameter, 108 miles long and capable of handling 10,000 bbl. per day.

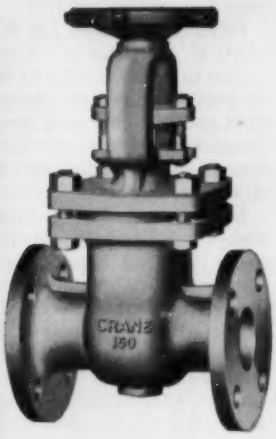
Since the largest pipeline up to this time was 3-in. line, this was a tremendous step. In addition, its route called for pumping oil over the Allegheny Mountains, which was considered "completely impossible" by many of the oil men of that day.

Some of the first new developments in the field of pipelining were incorporated in the design of this line in order to pump over high elevations. These included the development of high-pressure pumps, valves, and fittings that could withstand pressures up to 700 psi. which was a considerable feat in technology for that period. Other new techniques that had not been used before were large storage tanks at stations and terminals.

The first successful operation of two parallel lines marked another step in advanced technology in 1893. The United States Pipe Line Co. pumped crude oil from northwestern Pennsylvania to the Atlantic seaboard in one line and kerosine in the other. This operation could well have been the birth of the products pipelines.

After pumping standard white oil in the line successfully for about a year, the company tried pumping water-white oil through the same line. This was also very successful with only about 0.5% mixture between the two grades. The old United States Pipe Line Co. thus originated the system of batching products through the same line and set the pattern for products pipelining as we know it today.





"Craneloy 20"—No. 20045 gate valve. ½" to 12"; 150 psi at 500 F; 230 psi at 100 F.

Crane split-wedge disc design. Free-to-rotate discs employ special guides to prevent rubbing against seat during operation.

"Craneloy 20" valves—performance-proved on toughest corrosive fluids

The "Craneloy 20" gate pictured above controls highly corrosive, hot sulphuric acid sludge at a large Western refinery. While other valves in this service had to be replaced every 3 to 6 months, this Crane valve lasted a full 14 months before requiring minor repairs.

All parts in contact with the flow are "Craneloy 20"—a high-nickel, high-chromium stainless alloy—poured in Crane's own foundries.

Crane alloy valves (either "Craneloy 20" or Type 316 stainless) give you an extra measure of value. Unique design of the split-wedge disc provides *uniform* pressure all around the seating surface . . . eliminates need for high seating forces. Free-to-rotate discs minimize seating wear and prevent galling.

For details of other features and applications of Crane alloy valves, see your Crane Representative.

Get full facts on "Craneloy 20" and other Crane quality alloy valves. Ask your Crane Representative for Circular AD-2080 or write to the address given below.

CRANE® VALVES & FITTINGS

PIPE • PLUMBING • HEATING • AIR CONDITIONING

Since 1855—Crane Co., General Offices: Chicago 5, Ill.—Branches and Wholesalers Serving All Areas

handled, facilities available and many other factors.

Pumping the crude "as is" may be practical in viscosity ranges up to 10,000 to 30,000 S.U.s. As the viscosity goes up, however, pipeline investment and pumping costs obviously increase very rapidly and capacity decreases. Above certain viscosities it is, of course, impossible to pump as is.

Dilution and dilution recycling are always possible with almost any viscosity if diluent is available in necessary quantities and a second smaller pipeline is provided to get the diluent to the initial input point. This is not always possible or economical. Stable emulsions can also be made; however, for this process to be competitive it must use cheaper emulsification agents than are apparently available today.

Heating and reheating crude is fairly attractive for shorter lines where fewer reheat stations are needed. This is probably the most practical method in use; however, on extremely viscous crudes, the economics can change very rapidly.

High-speed conveyor belts are far too expensive both from the standpoint of initial investment and maintenance and would only be applicable for transporting extremely viscous crudes which would practically "stand alone." Many other factors would preclude the use of this equipment.

The water-addition core annulus-flow possibilities have captured the interest of some pipeline companies and university laboratories. In this process, under certain conditions, water injected into a pipeline with viscous crude forms a complete annulus around the oil.

The water takes the shear and allows the crude to flow as a plug. Laboratory experiments and field tests indicate interesting possibilities; however, a great deal of research is needed to fully explore all the limitations. For instance, if the annulus failed to maintain in a line carrying 100,000-S.U.s. oil and allowed the oil to come in contact with the pipe walls, the line would, of course, become seriously plugged with an unpumpable crude.

If enough were known about the process to keep the line within operable limits, extremely heavy crudes could be moved with the same size lines and same costs as the lighter oils. Perhaps this or another economical method of moving viscous crudes will be developed by the time it is urgently needed.

Automatic Welding

Looking at the equipment field for a moment, we see that a great deal of work in the last few years has been directed toward the development of an automatic pipe-welding process. Many different welding processes have been investigated for this purpose, including flash welding, pressure induction welding, thermit welding, etc. Only in recent months, two methods of double-jointing in a yard have been developed using the submerged arc process.

These developments have been considerable steps forward for they reduce over the ditch welds by one-half and speed pipeline construction. A German process designed for nonmanual pipe welding was recently demonstrated in this country and created a good deal of interest with both the pipeline companies and contractors.

There is a real need, however, for a completely automatic pipe-welding process—one that can do the job on the right-of-way, produce consistent weld quality, and be fast enough so that pipeline construction can be speeded up with resultant lower costs. With the amount of research effort presently being expended in this direction, it will not be surprising to see such an automatic pipe-welding process developed within this year.

Metering and Meter Proving

Positive-displacement meters have for many years done an excellent job in providing very fine accuracy in the measurement of both refined products and crude oils for the pipeline companies and other phases of the industry's operations. They will produce a consistent accuracy in the order of 0.05% if a proper maintenance and calibration program is maintained.

The prover-tank method and occasionally the gravimetric method of proving meters as outlined in API Code 1101 are excellent and precise methods and are undoubtedly largely responsible for the rapid growth of meters in the industry, but these methods are expensive to install and require a considerable amount of time and manpower. In order to obtain the maximum accuracy from positive-displacement meters with a minimum of time and manpower, push-button or automated meter-calibration systems are needed.

Here again, a great deal of work is being carried out in this field. The calibrated section of line, or "miracle mile," was a great step forward and is becoming more popular as a calibration method. Electromechanical and electronic calibration methods are being worked on, which will produce an accurate meter factor quickly and directly without computation, thus eliminating the chance of human error.

Also, in the measurement field, progress has been made in the development of turbine-type meters. Earlier tests indicated that this type of meter had possibilities only on products lines where viscosities are low. A device incorporated in the design of a turbine-type meter to correct for various viscosities now causes this type of meter to have interesting possibilities for the accurate measurement of crude oil having viscosities of several hundred S.U.s. or even higher.

Filtration

Filtration is another problem which may become more important to the products-pipeline people. Several papers have been presented on this subject at API meetings. However, in light of the large numbers of turboprop and pure-jet airliners in operation with many more to come, it might be well to re-examine our filtration practices.

Turboprop and jet-fuel systems handle much larger quantities of fuel than do reciprocating engines. These fuel systems contain many fine orifices and close tolerance parts. They operate at very high fuel pressures (1,200 psi.) and are therefore much more sensitive to wear and abrasion from dirt in the fuel than are piston engines.

Fuels, too, are heavier than aviation gasolines with higher viscosities and will hold dirt in suspension for longer periods of time. It is certainly to our interest to make certain that adequate designs and adequate equipment and techniques are provided in order that these fuels meet the requirements of the new aircraft from the standpoint of safety and operations.

Other Problems.

There are a number of other areas in the pipeline field in which research and development work is needed. The glass-reinforced plastic-pipe industry, for instance, has made rapid strides recently. This pipe can now be designed to meet pipeline operating pressures and the application possibilities are becoming very interesting.

Thin plastic pipeline coatings are also beginning to capture the interest of many in the industry and they also offer interesting possibilities. The design of centrifugal pumps for pumping viscous oils is another area in which there are many unknowns. Centrifugal pump designs are based primarily on water and are empirically fitted for application to viscous oil service. Very little is actually known about designing specifically for viscous fluids.

drill pipe · tubing to API standards (also extreme line casing and tubing manufactured under licence of Spang Chalfant) tool joints · drilling rigs Pipeline according to API standards · refinery equipment, such as: Piping of carbon and alloy steels · reactors · towers · columns · tanks and containers of every kind · heat exchangers · coolers · high-pressure vessels · valves and fittings · complete landing stages in tubular steel dolphin construction and offshore installations for the bunkering and unloading of tankers

Can Do!

When it comes to moving oil, steel pipe can do everything. More than 70 years ago Mannesmann made the first seamless steel pipe in history; today Mannesmann is one of the world's leading manufacturers of both seamless and welded pipe.
Everywhere Mannesmann pipe plays an outstanding part in pumping, drilling for, transporting, and refining petroleum.
To profit from our experience and workmanship, call

MANNESMANN

STEEL MANUFACTURING PLANTS AND PIPE MILLS IN GERMANY, BRAZIL AND CANADA
REPRESENTATIVES ALL OVER THE WORLD

295-2a

TWO BITS... TWO WELLS... TO

These two Reed Cobra bits *each* completed the entire 8¾" portion of a hole—from surface hole to bottom. One bit cut 6,770 feet in 152 hours. The other cut 6,268 feet in 98 hours.

Spectacular runs by Reed Cobra bits are becoming commonplace. Have you tried them lately, all the way? Your Reed representative will be glad to give you the whole story on these bits—and the complete line of Reed products.

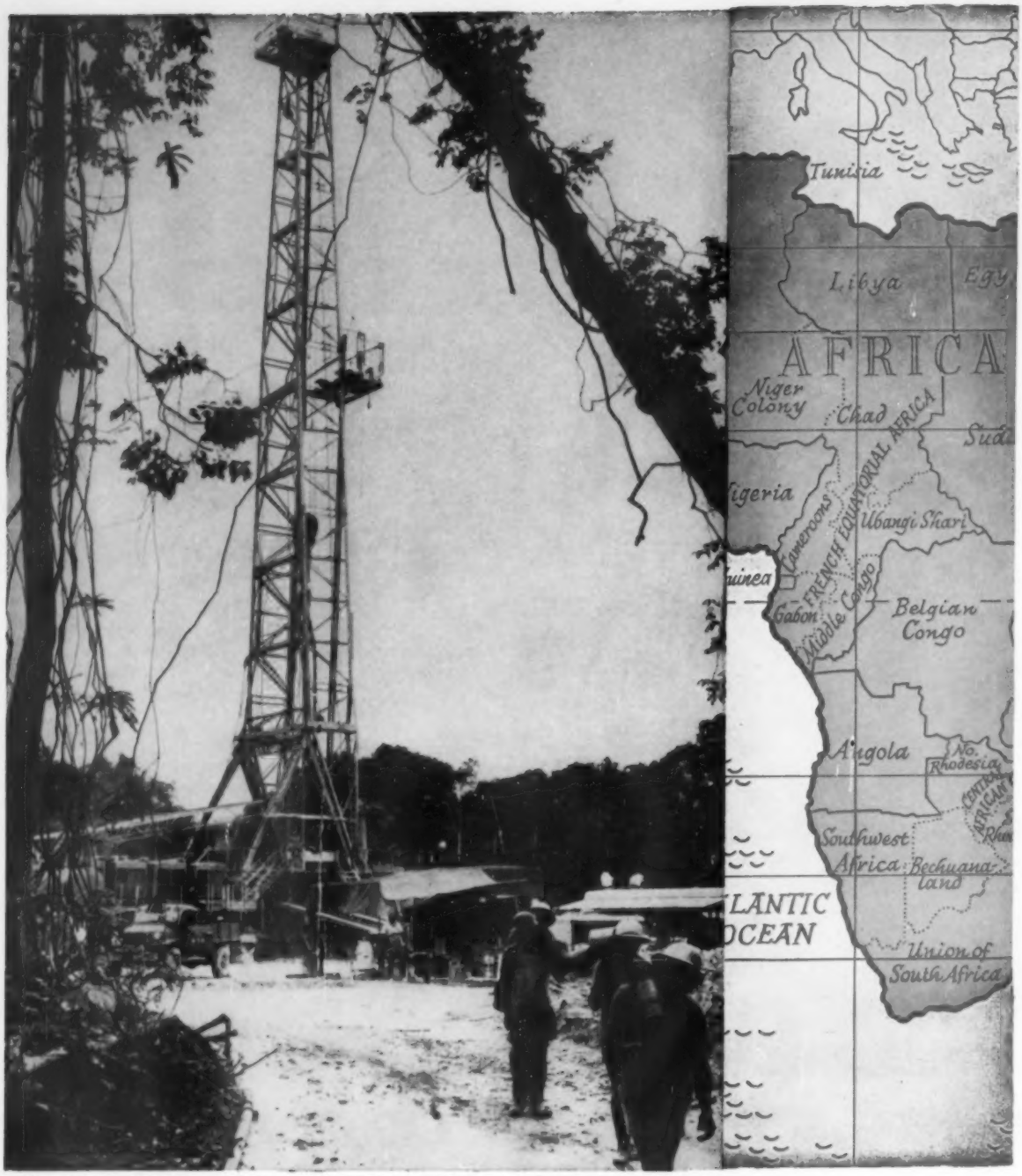
REED ROLLER BIT COMPANY *Houston 1, Texas*

EXPORT OFFICE: 1011 INTERNATIONAL BLDG., NEW YORK 20, N. Y. GULF COAST, MID-CONTINENT, ROCKY MOUNTAIN AND CANADIAN DISTRIBUTOR FOR MARTIN-DECKER PRODUCTS.

COMPLETION – 13,038 FEET

REED

REED'S ROLLIN'



131' LEE C MOORE CANTILEVER MAST IN FRENCH EQUATORIAL AFRICA

WHEREVER THE SEARCH FOR OIL . . .

. . . **LEE C. MOORE MODERN STEEL STRUCTURES.** LEE C. MOORE DESIGN ENGINEERS MAINTAIN A CONSTANT PROGRAM OF STUDY AND RESEARCH TO PROVIDE A WORLD-WIDE OIL INDUSTRY WITH STRUCTURES BEST SUITED TO SPECIFIC REQUIREMENTS.

P. O. BOX 216 • TULSA, OKLAHOMA • DALLAS • HOUSTON • CENTRALIA • ODESSA • NEW ORLEANS • CASPER • GREAT BEND • PITTSBURGH • EXPORT OFFICE: ROOM 624, INTERNATIONAL BLDG., 630 5TH AVE., NEW YORK 20, N.Y. • FOREIGN LICENSED MFR.: OIL WELL ENGINEERING CO., LTD., CHEADLE HEATH, STOCKPORT, ENGLAND

LEE C. Moore CORPORATION

Contamination reduction starts with design

The author says . . .

Contamination can be expensive to pipeline operation and therefore, any small reduction in such volume results in a direct saving. The design of tankage, manifolds, stations and auxiliary equipment for minimizing this loss is most worth while. It should be pointed out that greater savings from piping design and equipment arrangement will be accomplished in short lines involving a few stations. With long trunk lines there will be only a very small part of the total contamination attributable to station design.

BY WILLIAM W. HOLT, JR.
Technologist, Plantation Pipe Line Co.

WHEN SIMILAR miscible liquid petroleums are pumped adjacent to each other in a pipeline, mixing will occur. This mixing is called contamination by pipeliners. Other names in common use are commingling and interface. The extent of this mixing is affected by gravity and viscosity differences, velocity, pressure, turbulence, and distance traveled.

It is not the purpose of this paper to delve into the forecasts of the volumes of contamination resulting from all causes, but an attempt will be made to point out the important items that should be considered in the design of pipeline storage facilities, pumping stations, and terminals.

The contamination accumulation evolved in traveling a distance in a pipeline is not a total loss, but it can be a serious factor in the operation of an economical system. Each pipeline is faced with the handling or disposal of some maximum allowable contaminated volume. Some of the methods used are blending, refinery rerunning, and salvage selling.

Blending is the most frequently used and is by far the most economical. Here, the two adjacent petroleum liquids can normally have the contamination split equally into each. The quality of the resulting mixture is only minutely affected because the volume of contaminant is extremely small. The contaminated volume may be separated and then injected by a metering pump throughout a batch.

The scheduling of adjoining batches whose mixing can be satisfactorily disposed of is of utmost importance. There are some refined products and probably some crudes that are not compatible for marketing purposes, as an example, aviation 115/145 performance fuel must be heart-cut.

Assume that in a 25,000-bbl. batch there is 2,000 bbl. of contamination with aviation 100/130 performance fuel. The mixture can be blended into the lower-grade aviation fuel, but results in dollar value loss of 2,000 bbl. times the difference in cost (approximately 53 cents) or $1,060.00. This demonstrates the important economic advantage in maintaining contaminated volumes to an absolute minimum. Also, it shows that by proper batching, the loss is partially recoverable by increasing the volume of the lower-valued fluid.

For purposes of continuity this discussion will consider the pipeline system in the normal-flow sequence, i.e., tankage, tank lines, manifold, filtering and water-removal equipment, station piping, auxiliary station equipment, and terminal piping and equipment.

Tankage

Almost all pipelines necessarily have storage facilities at initiating stations and they may be either the property of the pipeline or of the shipper. This necessity results from the scheduling of compatible liquids for contamination handling and dispatching from an accumulated volume for continuous operation. Receipts into tankage should be carefully separated in order that a sharp interface and minimum contamination can be established when pumping into the pipeline.

Tanks can be constructed with sump bottoms which permit almost complete pumpout and consequently permit the tank to be used for storage of liquids having different specifications. Thus, when handling various petroleums, there is a sizable reduction in the number of vessels required in order to maintain segregation. Such tanks, when in this service, are very satisfactory in minimizing contamination.

The normal tank bottom, cone shaped with a water table for gaging purposes, contains a residual volume which cannot be removed at pipeline rates. This type of tank, in order to eliminate contamination, must be used for one specific liquid.

Transfer pumping, at low rates, can prepare these tanks for other service, but this can be a costly and time-con-

Presented at annual pipeline conference, American Petroleum Institute, Division of Transportation, Pittsburgh, under original title, "Design Considerations for Minimizing Contamination."

suming operation. It must be kept in mind that in filling an empty tank there exist the hazards of static discharges which are generated by splashing and high velocities of the liquid on and across the tank floor.

Blending in storage is readily accomplished with mixers. This equipment, if the cost of installation and operation can be justified, will uniformly disperse an injected liquid and will also break up stratifications.

Fill and pumpout lines for tankage should be constructed, if possible, with a proper drainage slope and without pockets or loops. Usually these lines are larger diameter than mainline pipe and velocities are lower; therefore, low places will trap water and dirt. Cleaning is almost impossible and drainage or pumpout will not dry them sufficiently for "swing" service. Long lines with several pockets can be a serious source of contamination.

Manifolds

Tank-farm manifolds with their headers, dividers, risers, crossovers, and valves give continual trouble because of leaks and pockets. If a tank farm and manifold is to be divided into specific storage areas of different products, such as all gasolines in one group of tanks and all fuels in another group, and it may be desired to interconnect these storage areas at infrequent intervals, it is most desirable to use skillet blinds.

If more frequent interchange of tankage will occur, the divider should be double-valved with a drain between the valves. Since sequential delivery into and pumping from various tanks cannot be scheduled, there exist some very serious contamination pockets in the manifold headers.

In order to overcome this trapped volume, at least one products pipeline has inserted a center vertical baffle along the axis of and just short of the length of the header. The reasoning is that flow between entrance and exit nozzles will sweep the header. It would be possible in designing a new manifold to provide connections at the end of the incoming and outgoing headers which would reduce some of the inherent pockets.

The manifold valves should be carefully selected in order to insure tight seals. With differential pressures, caused by varying tank heads and pumps, existing for long periods of time all along a manifold, serious contamination will result from leaking valves. Scheduled checks and preventive maintenance are necessary on all such valves. Faulty drain valves could allow leakage to sumps and repump tanks and result in unnecessary contamination.

The length of nozzles between valves and headers and risers should be kept to a minimum. Where there is a necessity for intertankage transfer, a separate small-diameter header should be provided. This has an added advantage in that tank transfers can be accomplished without interruption to normal operation.

Auxiliary Equipment

At initial stations there is usually auxiliary equipment that can add to the accumulation of contamination. These are filters, strainers, oil-water separators, and sump tanks. This gear depends on a reduction in flow velocity for its satisfactory operation and would therefore be in the form of a tank. The entrance and exit connections on all such tanks should be located at opposite ends and the resulting axial flow will sweep the tank clean.

Strainers with a permanent screen, which is normally cleaned by either reverse flow through or jetting of the dirty surface with clean liquid, can create a mixing problem. This liquid, if it is to be salvaged, must be allowed to stand long enough to permit the dirt to settle out. Should a batch change occur during this settling, the cleaning liquid might have to be pumped into another batch or held in a contamination tank.

This condition is eliminated if the strainer tanks are drained through the filtering medium to a holdover tank and then this clean liquid is repumped to the line at a point downstream of the strainers. The strainer medium is then cleaned with water and the resulting mixture drained to a flume for disposal. This water-cleaning system results in a definite separation of the petroleum from the dirt.

In handling some specific fuels, such as aviation grades and jet, it is economical to provide a bypass around the tank-farm manifold and schedule this pumping directly to the pipeline. All bypasses should be valved at each end and drained when they are not in service.

Station Piping

In the design of station piping consideration should be given to minimizing pockets, dead-end piping, and loops. All line pumps should have their suction and discharge valved at the header or bypass. Single-unit initial stations would have the pump connected directly into the line and not require a bypass. Drain lines should be connected to all pumps and under-the-floor loops.

Prior to batch changes, all idle pumps and loops should be drained. Again, as with manifolds, bypass lines should have valves at each extremity and be drained when not in service. Scraper launching and receiving facilities should be compact and in operation the line stream should be allowed to pass through both the scraper barrel and the bypass.

Drainage and sampling volumes can be accumulated in an underground tank and then pumped back into the line prior to batch changes. Leakage and spills would be passed through an oil-water separator tank and then into the repump tank.

This separator floats the petroleum on a water table, allows the dirt and water to settle out and, through a skimmer, drain to the repump tank. The water table should be adjustable in order to float off practically all petroleum prior to batch changes.

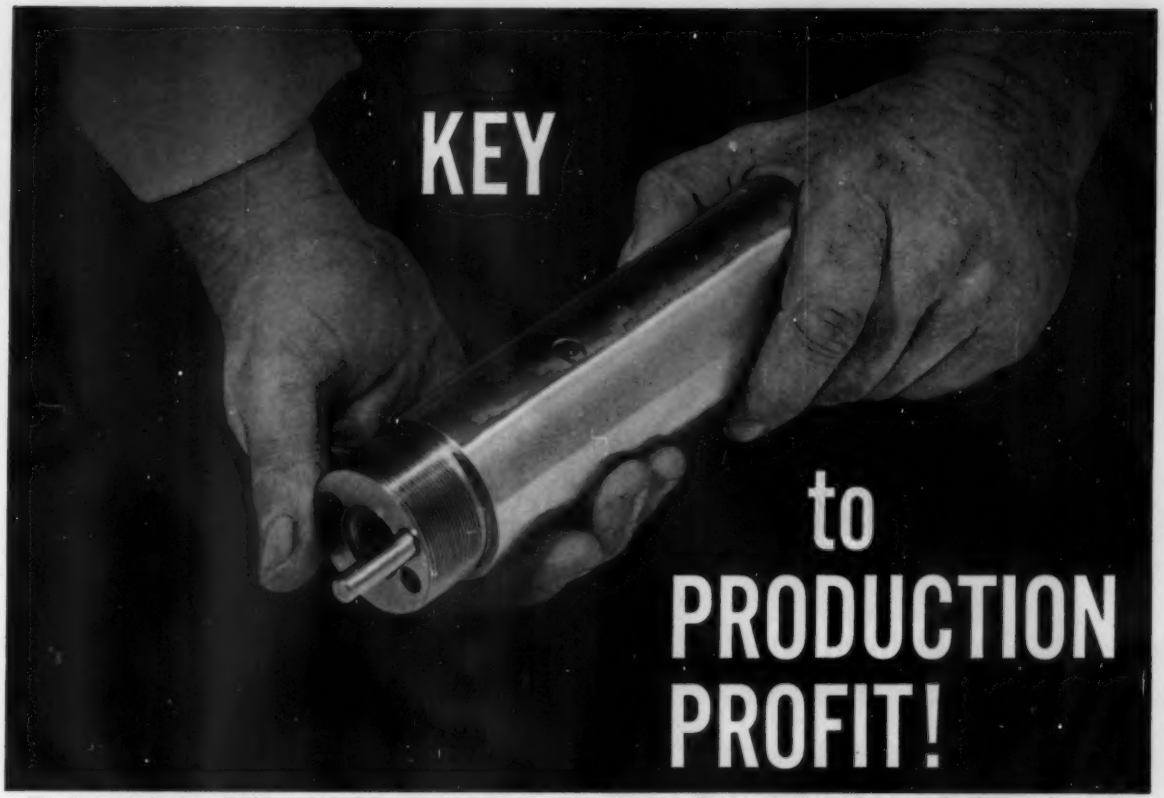
If low-pressure fittings and vessels are protected by relief valves, the volume necessary to prevent excessive pressures will determine how it is to be handled. Small amounts can be passed directly to the repump tank; larger amounts may require a more suitable tank. At points having tankage and facilities for contamination handling, the contamination tank can be used if it is large enough.

Terminal Facilities

Terminal facilities involve all of the problems previously covered and some additional details. If more than one meter is required to handle the maximum delivery rate, these must be manifolded for parallel flow. Entrance and exit may be at the same or opposite ends of the meter bank. In either case, when all meters are not on stream, those meter positions should be used that will best eliminate dead space and sweep the headers on batch changes.

Equipment acceptable to both the pipeline and the shipper for detecting batches must be provided at all delivery terminals. Normally, with custody transfer, this equipment is manually operated and consists of sampling and examination for changes in gravity or color. It would be most desirable to use a reliable instrument which would remotely indicate the composition of the interface.

In order to accomplish a continuous delivery from the main stream, and switch to different shippers on a batch change, meters should be provided with dual registers and the delivery header should have quick-acting valves. This gear will prevent a shutdown for changing delivery tickets and will also permit sharp cutting of the interface.



This flow-control valve—the key to SARGENT hydraulic pumping systems, the most efficient yet developed—is your key to production profit.

PROFIT = PRODUCTION – (Installation & Maintenance)

When SARGENT took the long stroke unit from the TOP of the hole and placed it at the BOTTOM to operate the time-proved standard bottom-hole pump, things happened!

WITH THE SARGENT FREE TYPE PUMP:

1. Sucker rods are eliminated, along with the cost of rod replacement and tubing wear.
2. Maintenance costs drop. No longer a need for costly crew time or expensive pulling equipment.
3. Maximum effective long, bottom-hole stroke is made possible by the exclusive SARGENT design which provides positive plunger travel with pre-set valve spacing.
4. Unrestricted application because the pump can be used on any well or on more than one well in group operations.
5. This pump has been operated on oil, salt water or fresh water as power fluid.

UNDER THE TOUGHEST FIELD CONDITIONS

"MISSILE QUALITY" PUMPS

"Missile Quality" represents the uncompromising excellence of product engineering and manufacture where "almost perfect" is not good enough. Years of experience in the design and production of missile, aircraft and marine components enables SARGENT to produce "missile quality" A.P.I. classified pumps in advanced metals and designs to meet any well condition – your assurance of better pump performance.

If you are interested in "production for profit" use SARGENT.
Talk to your SARGENT Representative and learn how profits can be boosted by lowered "Installation-Maintenance" costs.

SALES AND SERVICE

CALIFORNIA
Long Beach
Bakersfield
Ventura
Taft
Huntington Park
Santa Fe Springs

OKLAHOMA
Oklahoma City*
Ratliff City
Pawhuska
Seminole

NEW MEXICO
Farmington
Hobbs

COLORADO
Rangely

TEXAS
Odessa
Snyder
Andrews
Midland*
Sundown
Wichita Falls

ILLINOIS
Grayville

ARKANSAS
Magnolia

KANSAS
Chase
Russell
Great Bend*

*Sales Representation

"GOOD WILL" is the disposition of the pleased customer to return to the place where he has been well treated. – U. S. Supreme Court

Sargent
INTEGRITY
BUILDS GOOD WILL

Standard of Excellence Since 1920

ENGINEERING CORPORATION

MAIN OFFICE & PLANT • 2533 E. FIFTY-SIXTH ST.
HUNTINGTON PARK, CALIF.

FOR OUR
U.S. CUSTOMERS
...LINE PIPE, CASING
AND TUBING OF
UNVARYING FINE
QUALITY...UP TO
4½ INCHES O.D.

Our increased capacity enables us to assure immediate delivery anywhere in the United States. Phone, write or cable for details to

CANADIAN WESTERN PIPE MILLS LIMITED

VANCOUVER - PORT MOODY, BRITISH COLUMBIA, CANADA

TEL: WEbster 9-1131, CABLES: PIPEMILLS • BRANCH: CALGARY, ALBERTA, TEL: AMherst 2-9389

9-170

New books related to refining

CATALYSIS — VOLUME 6, HYDROCARBONS. Edited by Paul H. Emmett. Published by Reinhold Publishing Corp. 430 Clark Avenue, New York 22. 706 pp. $19.50.

This sixth volume in this outstanding series covers catalytic cracking, isomerization of hydrocarbons, polymerization, polymerization of olefins, alkylation, and hydroreforming.

Section 1 entitled catalytic alkylation of paraffins with olefins was written by Robert M. Kennedy of Sun Oil Co. Section 2, catalytic isomerization of hydrocarbons was written by F. C. Condon, chemist at City Corp. of New York. Section 3 on mechanics of polymer formation and decomposition was written by R. Simah of New York University and L. A. Wall of the National Bureau of Standards.

Polymerization of olefins, Section 4, was written by A. G. Oblad, M. W. Kellogg Co., and G. A. Mills and Heinz Heinemann, Houdry Process Corp. Section 5, catalytic cracking, was written by H. H. Voge, Shell Development Co. Section 6, catalytic reforming of pure hydrocarbons and petroleum naphthas was written by F. G. Ciapetta, R. N. Dobres, and R. W. Baker, W. R. Grace & Co.

AIR POLLUTION CONTROL. By W. L. Faith. Published by John Wiley & Sons, Inc., 440 Fourth Avenue, New York 16. 259 pp. $8.50.

This book is intended to present the basic facts which must be considered in any air-pollution control program, whether voluntary or required by law. The various aspects of the problem are discussed in a language easily understood not only by the technical people specializing in air pollution but also by the intelligent layman.

The book begins with an explanation of the effects of air pollution and the importance of meteorological variables. A discussion of the nature and source of the more common air pollutants follow. Detailed consideration is given to the methods of determining the amounts of these various contaminants in the air, the more appropriate means of controlling emissions at the source, and the legal means available for control.

Mention in varying detail is also made of the newer aspects of air pollution, particularly the automobile-exhaust problem and the hazard of radioactivity.

PRINCIPLES AND PRACTICES OF FLOW METER ENGINEERING. By L. K. Spink. Published by The Foxboro Co., Foxboro, Mass. 549 pp. $15.

This eighth edition of this popular book bridges the subject of flow meter engineering right up to date. It covers new primary designs and different tap locations, and touches on the basic principles of secondary elements.

Electronic computers have been used to provide many new labor-saving tables. Curves have been replotted wherever necessary to provide greater convenience or cover new data.

The book is thoroughly indexed with a detailed table of contents taking up six pages. This insures ease of use as a handbook.

While extremely useful as a handbook, the book is written primarily as a text. It develops thoroughly the principles of this science for the engineering student.

SAFETY IN PETROLEUM REFINING & RELATED INDUSTRIES. Compiled by George Armistead, Jr., for John G. Simmonds & Co. Published by Security Publishing Corp., 1000 Connecticut Avenue, Washington 6, D. C., $12.50.

The first edition was published in 1950 and in this new edition are results of the analysis of important accidents and fires occurring since 1950. The book covers in detail such subjects as: principles of safety, plant layout, fire protection of structures, operating practices affecting safety, relief and blowdown systems, storage tanks, outline of inspection practices, fire control and extinguishment, inspection tools and equipment.

The basic cause of accidents in the process industries are generally: (1) misoperation or improper practices, (2) equipment failure, (3) attempting to repair equipment while operating, (4) lightning, windstorm, etc., (5) improper equipment and miscellaneous.

This book contains sections relating to each of these basic causes, as well as provision of special equipment for accident prevention and protection of facilities. Special treatment is given to detonative combustion,

☆ **Economic Analysis**

To get dependable cost figures, you need a working estimate which relates all factors to your own location and requirements. We will be glad to develop figures which will be realistic and dependable.

☆ **Better Supply**

All commercial grades from Baltimore; Little Rock; Bossier City, La.; and Beaumont, Port Arthur, Pasadena, Texas.

sulfuric acid service

☆ **Acid Recovery**

Disposition of spent acid can be a considerable cost factor. We will work out recommendations for handling your spent acid to best advantage.

☆ **Safety**

Most important for new operations or new employees are complete safety and handling instructions. We furnish these in literature or in wall chart form.

Call your Olin Mathieson representative today. His knowledge of conditions, trends, and markets in the chemical industry can help you plan and buy with confidence.

6844

MATHIESON

OLIN MATHIESON
CHEMICAL CORPORATION
CHEMICALS DIVISION · BALTIMORE 3, MD.

control of oil spills, tank explosion and collapse, and brittle fracture and fatigue of metals, as well as requirements for safest practical equipment location and spacing.

EVALUATED WEATHER DATA FOR COOLING EQUIPMENT DESIGN. Published by Fluor Products Co., a division of the Fluor Corp., Ltd., Whittier, Calif. $35.

To operate, specifiy, or design atmospheric heat-exchange equipment, reliable weather data are a must. This manual is a condensed presentation of summer hourly observations taken in the last 10 years at approximately 400 continental United States stations and a number of foreign stations. Over 10,000,000 hourly observations were processed by machine at the National Weather Records Center at Asheville, N. C.

Wet-bulb frequency tables and maps for specific design levels are presented. Data on winds and dry bulb temperature coincident with high wet-bulb temperatures are also included. A separate comparison table is included showing the variance between the ARI (Air-Conditioning and Refrigeration Institute), the ASRE (American Society of Refrigerating Engineers) and the ASHAE (American Society of Heating and Air-Conditioning Engineers) recommended data to industry, compared with the findings of the Fluor manual. The ASHAE technical advisory committee on weather data has recommended use of the Fluor weather-data manual as basis for an interim standard.

MONOGRAPH 10—PHASE RELATIONS OF GAS-CONDENSATE FLUIDS, CORRELATIONS OF TEST RESULTS AND COMPONENT PROPERTIES. Volume 2 of two volumes. Published by the American Gas Association, New York 17, 523 pp. $15.

The second volume of this monograph of special interest to reservoir and transmission engineers of the natural-gas industry contains correlations of technical data obtained in 20 years of research conducted by the Bureau of Mines, U. S. Department of the Interior, in cooperation with the AGA.

The new publication contains 265 illustrations, 157 tables, and over 190,000 words of text. Four of the seven chapters describe correlations of the phase diagram of gas-condensate fluids. Correlations of the compressibility factor are presented in three chapters. The correlations of Volume 2 are based on data in Volume 1 and data taken from the literature. Descriptions of techniques and critical features of special apparatus are contained in nine appendixes.

MAKING THE MOST OF EVERY MOVE, by Garner Dodson. Published by G. P. Putnam's Sons, 210 Madison Ave., New York 16. 256 pp., $3.95.

This author presents a handbook for "displaced persons." The topic should be of vital concern to the nomads of oil or any other industry involving frequent transfers of personnel. It covers everything from soup to nuts—and you will thrive on the former and meet more than your quota of the latter if you move very often.

You are provided answers to most problems you will encounter. Probably the single thing that annoys the novice most in moving is the fear of the unknown. If you can anticipate your problems in advance, you are prepared to cope with them and moving can be a pleasant experience.

In this well-indexed volume all such questions are answered; it is more than a handbook, it is a check list. Careful consideration is given to the welfare and happiness of the children, and the book will prove invaluable to mothers and wives. Its completeness is displayed from tourist information centers to the specific voting requirements of every state.

It will carry you step by step from planning your move to the adjustments and enjoyments you will have after settling in your new home. It is a complete guidebook in direct, readable language.

PETROLEUM—PREHISTORIC TO PETROCHEMICALS. By G. A. Purdy. Published by McGraw-Hill Book Co., 330 West Forty-second Street, New York 36. 500 pp. $15.

This book is an account of the petroleum and petrochemical industries—tracing their development from geological and archaeological beginnings to present-day products.

Combining basic ideas with the latest technical concepts, this volume is intended to meet the need for a reference on the technology and products of petroleum. It is written in a way which will appeal to the nontechnical reader as well as the petroleum expert.

The book describes and shows the nature of petroleum; how it is found, produced, and transported; processes used to convert it into products; and the products themselves and their uses.

Such topics as the occurrence of petroleum searching; drilling; production; distillation; product control; gases and solvents, fuels, lubricants, waxes, and asphalts; and petrochemicals are covered in the various chapters. Specific refining operations for each of the major products are taken up in detail.

Many photographs and drawings are used to show details of equipment, processes, and products.

Note: The Oil and Gas Journal maintains a book department. Write to the READER SERVICE DEPARTMENT, P. O. Box 1260, Tulsa 1, for copies of the book list. Often books reviewed here may be purchased from this source.

...Join the group heading for the Lummus exhibit at the

WORLD PETROLEUM CONGRESS

LUMMUS

And be sure you sign up for the tour of Lummus' Engineering Development Center in Newark, N. J.

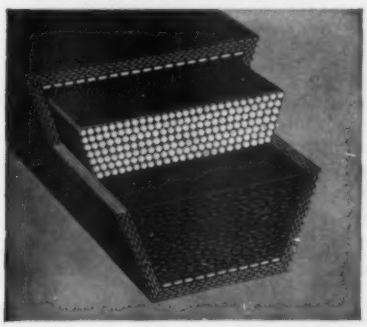
BOSTON Helps Set World Depth Record

History-making wildcat has used same BOSTON V-Belts since spudding-in in 1956. Belts look good for another 25,000 ft.

When the Phillips Petroleum Company's famous well, the University EE-1 in Pecos County, Texas, surpassed the former drilling-depth record in May, the crew had mastered a fair share of trouble . . . including a whipstock at a record depth of nearly 20,000 ft. And since then, they have set new records in length of casing . . . depth of pipe . . . total column of cement. And as of early September, they were still making hole.

Throughout this whole record-breaking performance, the same set of BOSTON V-Belts has been on the job driving the mud pumps . . . completely trouble-free, and looking as if they could go another 25,000 ft. They went to 17,500 without a take-up, and were re-set then only because bigger pumps were installed.

This whole remarkable achievement tells a lot about the men and the equipment on the job. And a closer look at the belts



involved will show exactly why they have played their part so well.

They were made by Boston Woven Hose and Rubber Company — a part of their standard line, which features every advanced development in the industry. The tensile members are Dacron* . . . with a moisture regain only 1/20th that of conventional reinforcing fibres, giving tremendous stability through humidity changes . . . 40% stronger than conventional tensile fibers . . . and put through a special heat and tensioning process for even greater stretch resistance.

To provide necessary resistance to oils, heat, abrasion, chemicals and ozone, BOSTON V-Belts are made with Neoprene. And the Fiber-Dispersed stock provides high cross-wise rigidity, exceptional length-wise flexibility, and extra support for the tensile members during shock-load impact and during normal operation.

*DuPont polyester fiber

Record Phillips' well approached 25,500 ft. in September

With new BOSTON Multiple V-Belts you, too, can cut down maintenance, save matching and take-up time, and reduce your V-Belt inventory. Remember, for industrial rubber products . . . including all types of hose and belting . . . BOSTON serves you best. For more information, write:

BOSTON

BOSTON WOVEN HOSE & RUBBER CO.
DIV. OF AMERICAN BILTRITE RUBBER CO., INC.
BOSTON 3, MASS.

A statistical analysis of

Future energy consumption in the U. S. (1959-1965)

This look at the growing need for energy assumes a minimum average increase in labor productivity of 2% a year and population growth of 1.93 million per year.

BY JACK MELNICK

THAT there is an obvious relationship between energy consumption and economic well-being in the United States is indisputable. One need only point to the use of energy in fostering increases in productivity to understand its impact upon the level of national output.

If the American people are to continue making strides in avoiding want and enjoying the "material blessings," there will have to be simultaneous increases in the consumption of energy. These increased demands will be met by expanding the use of traditional sources of energy plus the probable use of supplies made available by future, economically developed alternative sources of existing energy resources.

Moreover, this steady rise in energy consumption will occur despite the advances that are likely to be made in the efficiency with which energy is used. Innovations and changes in the design of the energy-consuming units which will undoubtedly appear will make for more effective use of energy, thus raising the energy-efficiency factor.

However, an adequate, dependable, and continuous indigenous supply of energy will be possible only in an understanding and flexible "political" environment.

There is no provision here made for a commercially practicable nuclear power supply for the period under review. Progress in this direction by 1965 will likely be small in comparison with the contribution of existing primary sources of energy.

EQUATION 1—PER CAPITA DEMAND FOR ENERGY IN U. S.

$$E_t - E_{t-1} = -1{,}923.9\,P_t + 119.8\,P_t\left(\frac{W_t}{P_t} - \frac{W_{t-1}}{P_{t-1}}\right) + \frac{E_{t-1}}{P_{t-1}}(P_t - P_{t-1})$$

Where:

E = total energy consumption measured in trillions of B.t.u.
P = population measured in thousands as of July 1 of each year
W = gross national product measured in billions of dollars at 1957 prices

It is the purpose of this article to estimate the energy requirements necessary to meet the growing needs of the American economy through the year 1965.

I—Forecast of U. S. Total Energy Requirements, 1959-65

Since there is an interdependent relationship between the amount of energy used up in producing the bundle of goods and services and the size of that bundle, an empirical investigation of the relationship between per

About the author:

Jack Melnick is an independent consulting economist with offices in New York City. He also is a lecturer in economics at Brooklyn College.

Following completion of graduate and postgraduate studies in economics, mathematics, and statistics at Columbia University, Melnick served as an economist for Shell Oil Co.

He later was senior economist for California Texas Oil Co., Ltd., and more recently served as senior consultant for a leading firm of management and economic consultants.

Oilfield jobs make some of the toughest hauling in the world—yet Autocar handles them all with ease and sureness!

"Easy with Autocar . . . tough with anything less"

Out in the oilfields where terrain is rugged and loads are giant-sized, custom-engineered Autocar trucks and tractors handle with ease the jobs that would tear lesser rigs apart.

This heavy-duty tractor is designed to get maximum loads of equipment where it's needed, when it's needed, with greater dependability and lower maintenance.

Every Autocar is custom engineered to specific operating conditions. *Every* component is designed to form an integrated, balanced unit for the job you want it to do...providing unequaled strength, ruggedness and staying power that make any job cost less.

See it, drive it . . . and you'll never again settle for anything less than the "world's finest."

Autocar
"World's Finest"

Division of
The White Motor Company
Exton, Pa.

EQUIPPED FOR SERVICE

The more ways a company can serve you, the better will be your opportunity to use it profitably. And here's a service organization experienced in not just one, but *three* fields . . . petrochemical, chemical and petroleum processing.

Suppose you want to test a process without disrupting work you may now have in progress. Call on HOUDRY Contract Service for facilities and experienced manpower. Assign to HOUDRY the job of developing your ideas, and testing them in pilot plant operation.

Then, if you wish, HOUDRY can assist you in commercializing your process. Or, if you want to improve the performance of a processing plant now on stream, HOUDRY can bring you the benefits of the newest advances in processing and catalysts, and experienced service in every phase of chemical, petrochemical and petroleum processing.

In short, if your company is at all concerned with these fields, you will find HOUDRY equipped, willing, and highly able to serve you well.

*HOUDRY

PROCESS CORPORATION

1528 Walnut Street, Philadelphia 2, Pa.

*Houdry means Progress . . . through Catalysis

capita energy consumption and economic well-being will provide a useful tool for projecting the trend of national energy requirements.

Total energy consumption in the United States will here be measured by B.t.u.'s. And, "economic well-being" will be measured by per capita gross national product.

Statistical measurement of the relationship containing the year-to-year changes in these variables produces Equation 1.

This equation is an expression of the per capita demand for energy in the United States.

That the equation is in accord with economic logic is demonstrated by the negative character of the constant term, "−1,923.9." It shows increasing efficiency in use of energy. Moreover, the equation reveals not only the combined impact of changes in all the other factors upon change in energy consumption, but also their impact as separate and distinct factors.

Thus, "$-1{,}923.9\ P_t$" represents savings in total energy consumption effected during time "t." Also, "$119.8\ P_t$" represents that part of the actual change in energy consumption accounted for by the change in per capita gross national product.

In addition, when the previous per capita energy consumption is multiplied by the change in population from that year to the next, the product represents the change in energy consumption due to the change in population. Thus, the right-hand side of the equation permits isolation of the separate effects of the factors in determining changes in energy consumption.

On the basis of the derived equation, total energy use in the United States may be reliably estimated, on two assumptions: (1) that average hourly labor productivity will increase at a minimum long-run linear annual growth rate of about 2%, and (2) that the growth of population will approximate the 1.93 million annual rate estimated by the Census Bureau, which projects a 1965 population of 199.0 million.

Thus, energy consumption will be gaining at a rate almost double the indicated rate for the 1948-58 period. By 1965, energy use will have reached a level of 55.1 quadrillion B.t.u., 31.4% more than the 41.9 quadrillion B.t.u. consumed in 1958.

II—Distribution of Future Energy Requirements by Source

The determination of the probable makeup of the nation's future energy input requires an examination of factors influencing growth in each of the major categories of energy supply.

TABLE 1—ESTIMATED TOTAL ENERGY CONSUMPTION IN THE UNITED STATES

Years	Trillions of B.t.u.
1959	43,381
1960	45,110
1961	46,929
1962	48,827
1963	50,813
1964	52,895
1965	55,064
Annual compound rates of growth:	**Per cent**
1948-58	2.1
1958-65	3.9

However, it is not possible to make predictions, based on elaborate statistical analysis, for each of the nonpetroleum energy sources because of shifts in the patterns of energy use. These shifts have been due to technological advances, cyclical movements in the economic environment, substitutability among forms of energy, and legislative action.

Therefore, the future behavior of coal, natural gas, and water power will be determined largely on the basis of established trends, modified by current developments in the economic, political, and technological spheres of influence.

In the case of petroleum, modern statistical techniques can be used in appraising the probable future patterns of behavior.

(1) Forecast of Petroleum's Share of the Future Energy Market, 1959-65

The analyses and forecasts described below are the product of a rather intensive statistical inquiry into the nature of, and the forces governing United States domestic demand for all oils.

A. Building-Block Approach

The methodology used here attempts to measure petroleum's probable share of the energy market for the 1959-65 period through an analysis and projection of the major products.

(a) Forecast of Domestic Demand for Motor Fuel, 1959-65

Statistical testing of the many possible factors influencing the demand for motor fuel in the United States resulted in the acceptance of the following determinants as being largely responsible for the existing pattern of motor-fuel consumption. They are: motor-vehicle registrations, retail gasoline price, and employment. A fourth factor, population, enters indirectly in the construction of the final gasoline-demand function.

Clearly, the first two factors have a direct bearing upon the gallonage consumed. However, not so clear was the identification of "unemployment" as representative of the economic climate.

Many measures that show the level of business activity correlate reasonably well with motor-fuel consumption, but none is so sensitive nor do any others reflect the direct impact upon motor-fuel sales as well as unemployment.

Retail gasoline price aids the analysis by orienting the level of purchases within the framework of cost. This, despite the contrary view long held by many analysts, i.e., the belief that purchases of motor fuel are insensitive to changes in price. Motor-fuel sales aren't much affected by minor shifts in price. But, major changes, especially during periods of declining business activity, reveal a departure from this solid and insensitive position. As such, due recognition is given to price in this analysis.

The inclusion of motor-vehicle registrations is fairly obvious. They constitute the overwhelming proportion of the gasoline-consuming units.

There are, of course, factors, in addition to those already mentioned, which produce gradual changes in motor-fuel consumption. These factors have not been used, either because of lack of data or the fact that certain of the factors do not lend themselves to measurement. However, proper account of these factors in the aggregate is provided in the motor-fuel-demand equation.

Fig. 1 shows the close conformance between the actual levels of motor-fuel demand and the estimates of motor-fuel demand derived from the equation. These estimates of motor-fuel demand in the United States for the 1959-65 period are shown in Table 2.

(b) Forecast of Domestic Demand for Intermediates (Distillate Fuels and Kerosine), 1959-1965

The selection of the variables used to explain the future behavior of demand for intermediates in the United States followed a procedure similar in many respects to the one discussed for gasoline.

Heating and the railroad markets account for approximately 75.3% of total distillates consumed. Total distillates consumption, in turn, accounts for 85.0% of total intermediates. Therefore, it seems reasonable to consider the forces governing the level of distillates demand as being synonymous with the determinants of demand for intermediates. That portion of kerosine going into jet fuel is an exception.

Since by far the greater portion

The V.P. said,

"STOP

. . . Stop right now, if you're trying to tell me there's anything different about your cobalt moly catalyst."

That's the kind of talk we like.

Sure, we believe in recommending our own product . . . for desulfurization, denitrogenation, hydrogenation of olefins, in the hydrotreating of naphtha feeds to reforming processes, and other general hydrotreating service. But we not only recommend it, we can give you some unique assistance in making sure you're getting all the return you can.

As process designers, our people know your problems and can fully understand your special requirements. From actual experience in industry, they know the importance of details so often forgotten, such as handling costs, storage problems, and special information for your processing personnel.

Catalysis is a way of life with us. Tell us your requirements, and let us prove it to your advantage.

*

HOUDRY

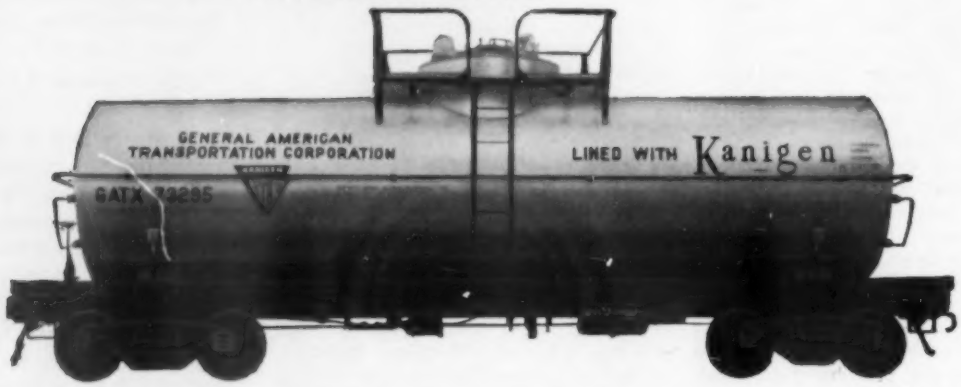
CATALYSTS

HOUDRY PROCESS CORPORATION

1528 Walnut Street, Philadelphia 2, Pa.

*Houdry means Progress . . . through Catalysis

Biggest plating job on wheels



The interior of this General American tank car is chemically plated by the KANIGEN® process, which deposits a hard, uniform, corrosion-resistant, lifetime nickel alloy coating. You can load at high temperatures. For example, 73% caustic soda can be piped in at unlimited temperatures. GATX tank cars lined with KANIGEN are also being used successfully for liquids such as tetraethyl lead, glycerine, ethylene oxide, resins, fatty acids, glucose, and many others.

Call us about tank cars lined with KANIGEN as well as the many other special GATX cars. Lease from GENERAL AMERICAN without capital investment or operating worries.

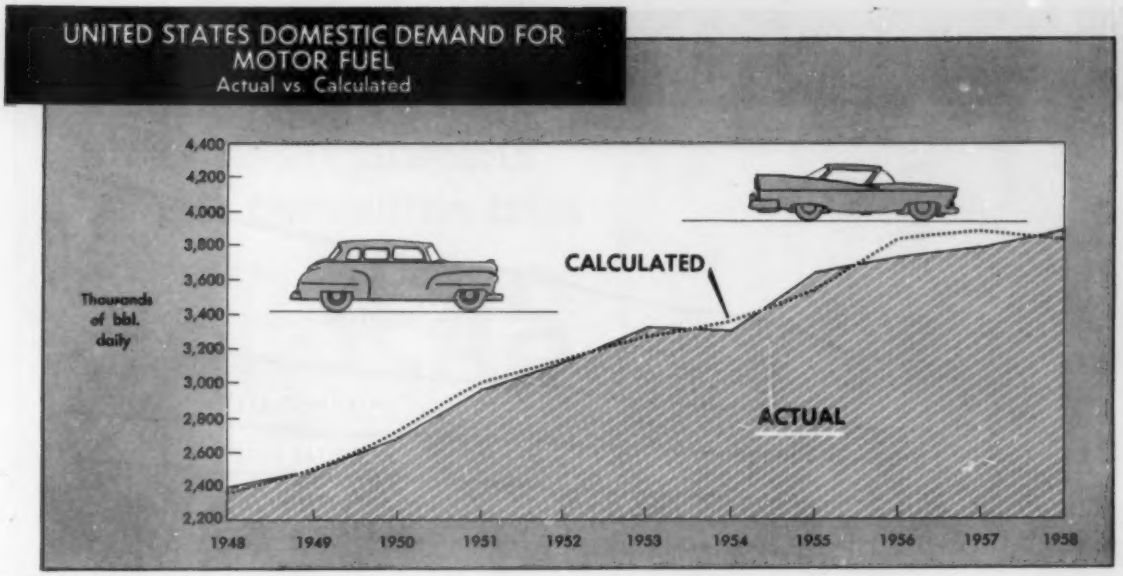
You'll find *it pays to plan with General American.*

Tank Car Division

GENERAL AMERICAN TRANSPORTATION CORPORATION

135 South LaSalle Street
Chicago 90, Illinois
Offices in principal cities

GATX GENERAL AMERICAN TRADE MARK



ESTIMATES OF MOTOR-FUEL DEMAND derived from Equation 2 are represented by the dotted line. Note the close conformance between these estimates and actual levels of demand shown by the solid line. Fig. 1.

EQUATION 2—MOTOR-FUEL DEMAND

$$M_t - M_{t-1} = 0.1641\ P_t + 0.0432\ P_t \left(\frac{R_t}{P_t} - \frac{R_{t-1}}{P_{t-1}} \right)$$

$$- 0.0491\ P_t \left(\frac{U_t}{P_t} - \frac{U_{t-1}}{P_{t-1}} \right) - 0.0229\ P_t\ (p_t - p_{t-1})$$

$$+ \frac{M_{t-1}}{P_{t-1}} (P_t - P_{t-1})$$

Where:

- M = motor-fuel demand measured in thousands of barrels daily
- R = motor-vehicle registrations measured in thousands
- U = unemployment measured in thousands
- p = retail gasoline price measured in cents per gallon at (1947-1949) prices
- P = population measured in thousands as of July 1 of each year

TABLE 2—ESTIMATED DOMESTIC DEMAND FOR MOTOR FUEL IN THE UNITED STATES

Years	M/bbl. daily
1959	4,100
1960	4,289
1961	4,479
1962	4,678
1963	4,876
1964	5,083
1965	5,293

Annual compound rates of growth:	Per cent
1948-58	5.0
1958-65	4.5

of intermediates is consumed in the heating-oil market, the number of central burners in use and the number of degree-days on a weighted basis were selected as the principal determinants. Now that the railroads are almost completely dieselized, the demand for diesel fuel oil will exhibit greater cyclical characteristics. This established the need for an indicator of general business activity. The FRB index of industrial production was found upon testing to be a more meaningful indicator than the gross national product. Having determined the nature of the variables, the statistical demand function was constructed to describe demand for the forecast period, 1959-65.

(c) Forecast of Domestic Demand for Residual Fuel Oil, 1959-65

Since the industrial sector represents the chief market for the residual fuel oils, the FRB index of industrial production was selected as an

TABLE 3—ESTIMATED DOMESTIC DEMAND FOR INTERMEDIATES IN THE UNITED STATES

Years	M/Bbl. daily
1959	2,205
1960	2,290
1961	2,379
1962	2,473
1963	2,589
1964	2,696
1965	2,808

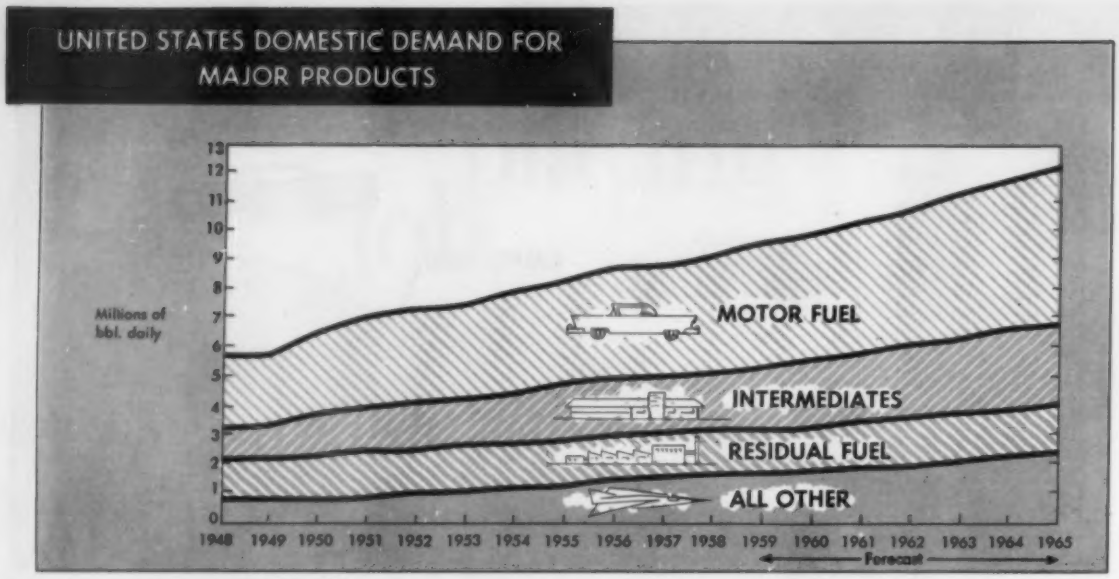
Annual compound rates of growth:	Per cent
1948-58	5.4
1958-65	4.2

EQUATION 3—DEMAND FOR INTERMEDIATES IN THE UNITED STATES

$$\Delta I = 1.66 + 0.0254\ \Delta B\ (D_d) + 4.3582\ \Delta F$$

Where:

- I = intermediates demand measured in thousands of barrels daily
- B = number of central burners in use measured in thousands
- D_d = number of degree-days on a weighted basis
- F = FRB index of industrial production (1947-1949 = 100)
- Δ = year-to-year changes


UNITED STATES DOMESTIC DEMAND FOR MAJOR PRODUCTS
Millions of bbl. daily
MOTOR FUEL
INTERMEDIATES
RESIDUAL FUEL
ALL OTHER
1948 1949 1950 1951 1952 1953 1954 1955 1956 1957 1958 1959 1960 1961 1962 1963 1964 1965
Forecast

DOMESTIC DEMAND FOR PETROLEUM PRODUCTS since 1948 with a projection to 1965 is shown in the top line of the chart. The shaded segments serve to illustrate graphically the breakdown of demand into its component parts. Note that the growth rate for residual is expected to be higher than for the 1948-58 period but less than for other major products. Fig. 2.

explanatory variable. While this indicator best explains total fuel needed for a given level of business activity, it is nevertheless useful in providing the framework for projections of residual-fuel-oil consumption. In addition to this variable, other factors should be considered for the purpose of separating the contribution of residual fuel oil from that of total fuels.

However, the same purpose is served by arranging the basic relationship in such a statistical design as to account for the influence of natural gas and coal. The latter procedure was adopted, simply because the variables were either unmeasurable or presented inconsistencies over periods of time. Thus, Equation 4 is an expression of the demand for residual fuel oil in the United States.

Based on this derived equation, residual-fuel-oil demand in the United States may be estimated for the period, 1959-65.

TABLE 4—ESTIMATED DOMESTIC DEMAND FOR RESIDUAL FUEL OIL IN THE UNITED STATES

Years	M/bbl. daily
1959	1,485
1960	1,515
1961	1,545
1962	1,590
1963	1,635
1964	1,680
1965	1,732
Annual compound rates of growth:	**Per cent**
1948-58	0.4
1958-65	2.8

EQUATION 4—DOMESTIC DEMAND FOR RESIDUAL FUEL

$$R_t = -22.88 + 7.52\,(F_t - F_{t-1}) + R_{t-1}$$

Where:
R = residual-fuel-oil demand measured in thousands of barrels daily
F = FRB index of industrial production (1947-1949 = 100)

EQUATION 5—DOMESTIC DEMAND FOR "ALL OTHER"

$$O_t = 57.70 + 1.93\,(G_t - G_{t-1}) + O_{t-1}$$

Where:
O = all other demand measured in thousands of barrels daily
G = gross national product measured in billions of dollars at 1957 prices

EQUATION 6—DOMESTIC DEMAND FOR ALL OILS ("Share of Market" Approach)

$$P_t = 428.67 + 0.3063\,(E_t - E_{t-1}) + P_{t-1}$$

Where:
P = domestic demand for all oils measured in trillions of B.t.u.
E = total energy consumption measured in trillions of B.t.u.

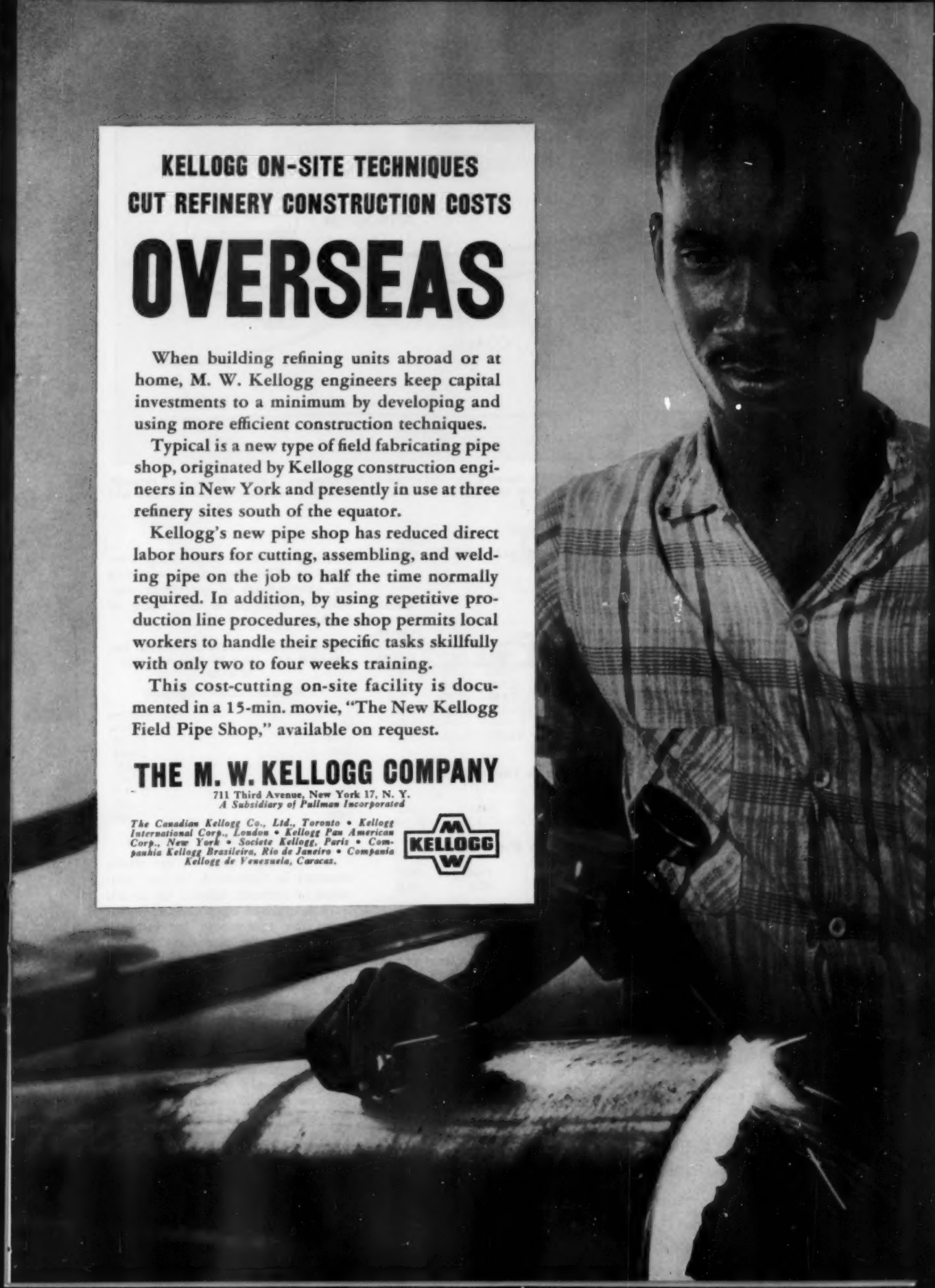
EQUATION 7—DOMESTIC DEMAND FOR ALL OILS ("Self-Generating" Approach)

$$P_t = -3{,}751.2 + 0.1385\,P_{t-1} + 45.54\,G$$

Where:
P = domestic demand for all oils measured in trillions of B.t.u.
G = gross national product measured in billions of dollars at 1957 prices

(d) Forecast of Domestic Demand for "All Other" (Jet Fuel, Lubricants, LPG, Wax, Asphalt, Road Oils, Still Gas, and Losses), 1959-65

The remaining portion of domestic demand is primarily a function of gross national product and a host of miscellaneous factors influencing each of the above elements. By treating this relationship as in Equation 5, the aggregate impact of the latter factors may be measured.



KELLOGG ON-SITE TECHNIQUES CUT REFINERY CONSTRUCTION COSTS

OVERSEAS

When building refining units abroad or at home, M. W. Kellogg engineers keep capital investments to a minimum by developing and using more efficient construction techniques.

Typical is a new type of field fabricating pipe shop, originated by Kellogg construction engineers in New York and presently in use at three refinery sites south of the equator.

Kellogg's new pipe shop has reduced direct labor hours for cutting, assembling, and welding pipe on the job to half the time normally required. In addition, by using repetitive production line procedures, the shop permits local workers to handle their specific tasks skillfully with only two to four weeks training.

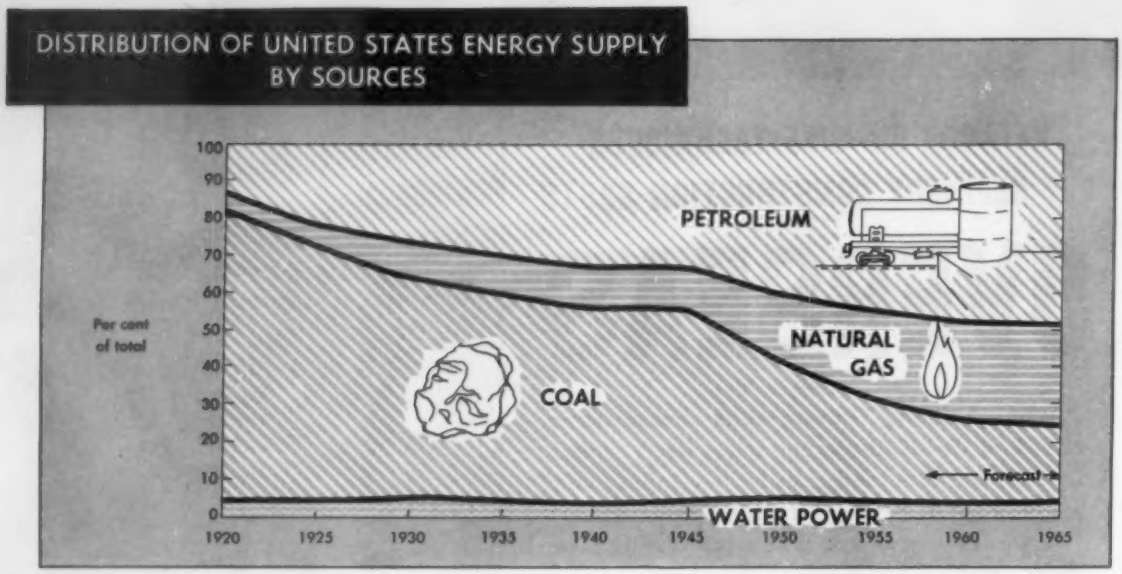
This cost-cutting on-site facility is documented in a 15-min. movie, "The New Kellogg Field Pipe Shop," available on request.

THE M. W. KELLOGG COMPANY

711 Third Avenue, New York 17, N. Y.
A Subsidiary of Pullman Incorporated

The Canadian Kellogg Co., Ltd., Toronto • Kellogg International Corp., London • Kellogg Pan American Corp., New York • Societe Kellogg, Paris • Companhia Kellogg Brasileira, Rio de Janeiro • Compania Kellogg de Venezuela, Caracas.

M KELLOGG W



PETROLEUM'S SHARE OF THE ENERGY MARKET in this country has increased at the expense of coal. Projections through 1965 show annual growth rates of 4.3% for petroleum and 1.7% for coal. Marketed production of natural gas will represent 27.5% of total energy supply by 1965. Fig. 3.

TABLE 6—ESTIMATED DOMESTIC DEMAND FOR ALL OILS IN THE UNITED STATES

(Thousands of barrels daily)

Major products—	1959	1960	1961	1962	1963	1964	1965	Annual compound rates of growth, 1958-65
Motor fuel	4,100	4,289	4,479	4,678	4,876	5,083	5,293	4.5
Intermediates	2,205	2,290	2,379	2,473	2,589	2,696	2,808	4.2
Residual fuel	1,485	1,515	1,545	1,590	1,635	1,680	1,732	2.8
All other	1,739	1,831	1,923	2,019	2,115	2,213	2,313	5.1
Total	9,529	9,925	10,326	10,760	11,215	11,672	12,146	4.3

ESTIMATED DOMESTIC DEMAND FOR ALL OILS IN THE UNITED STATES
(Trillions of B.t.u.)

1959	1960	1961	1962	1963	1964	1965
20,571	21,421	22,282	23,216	24,195	25,178	26,198

Petroleum's Share of Future Energy Market (Per Cent)

1959	1960	1961	1962	1963	1964	1965
47.4	47.5	47.5	47.6	47.6	47.6	47.6

On the basis of this equation, "all other" demand in the United States may be estimated, for 1959-65.

TABLE 5—ESTIMATED DOMESTIC DEMAND FOR "ALL OTHER" IN THE UNITED STATES

Years	M/bbl. daily
1959	1,739
1960	1,831
1961	1,923
1962	2,019
1963	2,115
1964	2,213
1965	2,313
Annual compound rates of growth:	Per cent
1948-58	7.6
1958-65	5.1

(e) Forecast of Domestic Demand for All Products, 1959-65

A summary of projections presented in sections (a) through (d) yields a forecast of domestic demand for all oils. These results when converted on a comparable B.t.u. basis and expressed as a per cent of total energy requirements, describes petroleum's share in the future energy market. Fig. 2 shows graphically a breakdown of demand into its component parts.

B. "Share of Market" Approach

As a check on the reasonableness of these results, domestic demand for all oils for 1959-65 was analyzed by evaluating its position vis-a-vis the projected levels of total energy consumption. This manner of estimating the consumption of petroleum may best be described as the "share of market" approach.

TABLE 7—ESTIMATED DOMESTIC DEMAND ALL OILS IN THE UNITED STATES

("Share of Market" Approach)

Years	Trillions of B.t.u.
1959	19,738
1960	20,696
1961	21,682
1962	22,692
1963	23,729
1964	24,795
1965	25,888

C. "Self-Generating" Approach

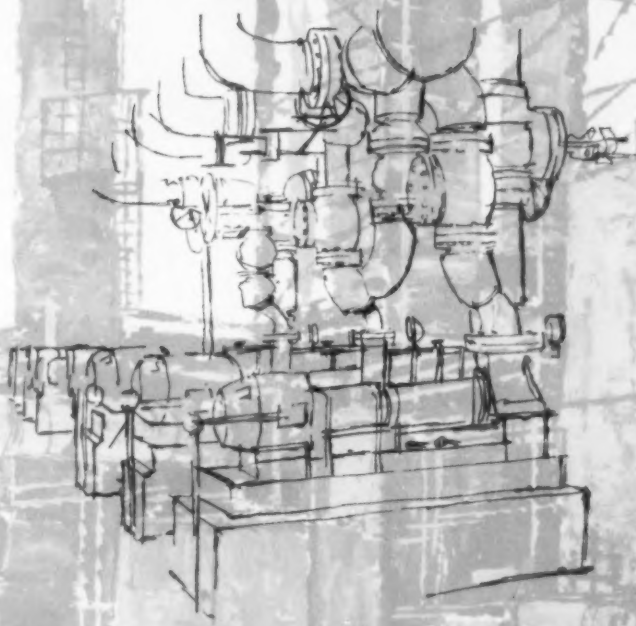
As a further check on the results obtained in Section A forward estimates of domestic demand for all oils were determined empirically by measuring the relationship between the consumption of petroleum in any given year with an index of the overall economic climate in that year and with the consumption of petroleum in the immediately preceding year. This manner of measuring future levels of consumption may be described as an economically oriented "self-generating" petroleum function.

As the results obtained show, the outcome of such computations agrees very closely with that obtained by projection of domestic demand for all oils by component parts. Thus, the initial forecast is confirmed.

The summary listed in Table 9 af-

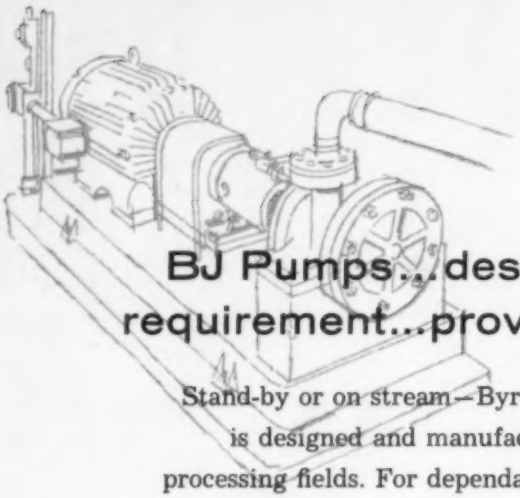
(Continued on page 159)

Reliable Pumps for the process industries



Byron Jackson Pumps, Inc.

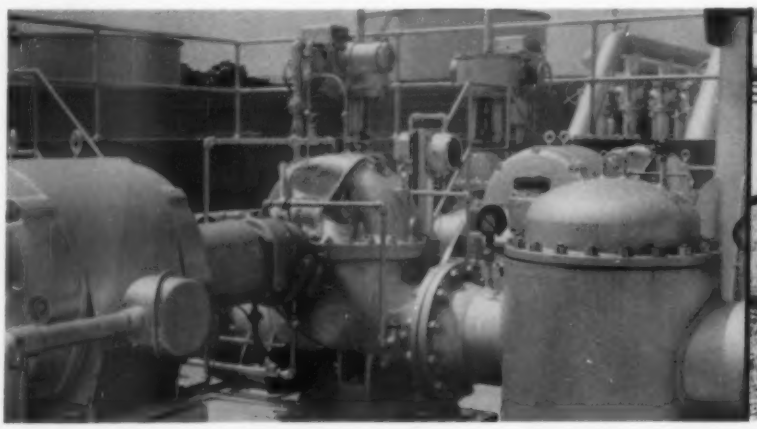
Fold Out



BJ Pumps...designed for every processing requirement...proved in every kind of service!

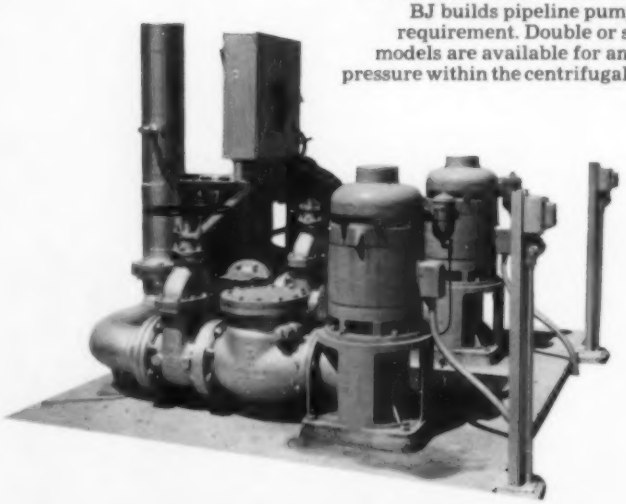
Stand-by or on stream—Byron Jackson's complete line of centrifugal pumps is designed and manufactured to match the most difficult service of the processing fields. For dependable performance under extremes of temperature and pressure, for corrosive, toxic or volatile fluid pumping, and even for handling radioactive liquids, BJ's long experience is invaluable.

For even greater efficiency, reliable Borg-Warner Mechanical Seals are available on every type of BJ Pump shown in these typical installations.

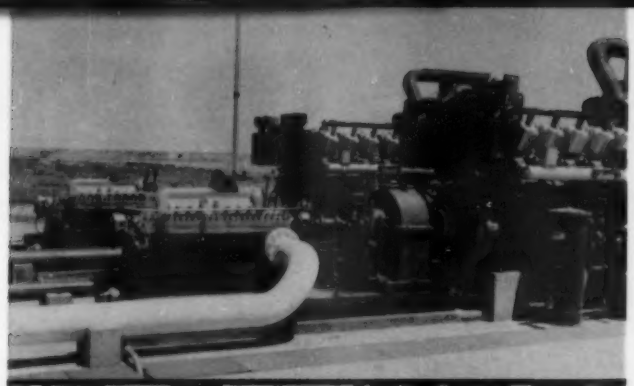


PIPELINE PUMPS From this crude-oil pipeline booster pump in Louisiana, to high-speed, gas-turbine driven, unattended units in the Arabian Desert, BJ builds pipeline pumps to suit any requirement. Double or single suction models are available for any capacity or pressure within the centrifugal pump range.

SUMP PUMP Even the least dramatic pumping job demands dependable operation in the processing field. BJ Sump Pumps, such as this open pipeline station installation, have been proved under the most severe conditions of nature and abuse.



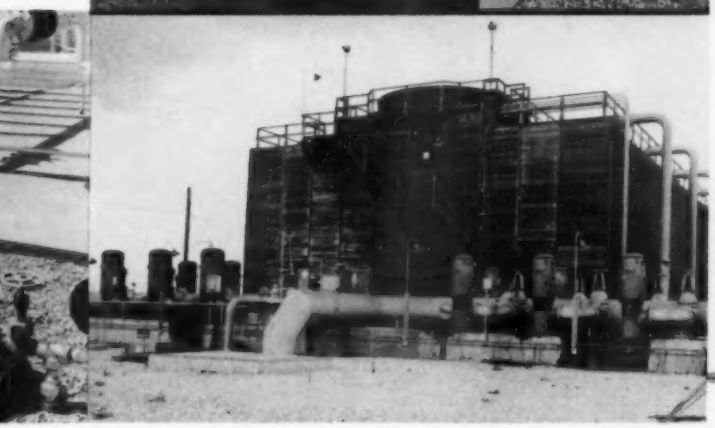
DEEPWELL TURBINE PUMPS
For the most basic pumping requirement – primary water supply – BJ's combinations of pump bowl, impeller, lubrication, driver and discharge head will answer any need.

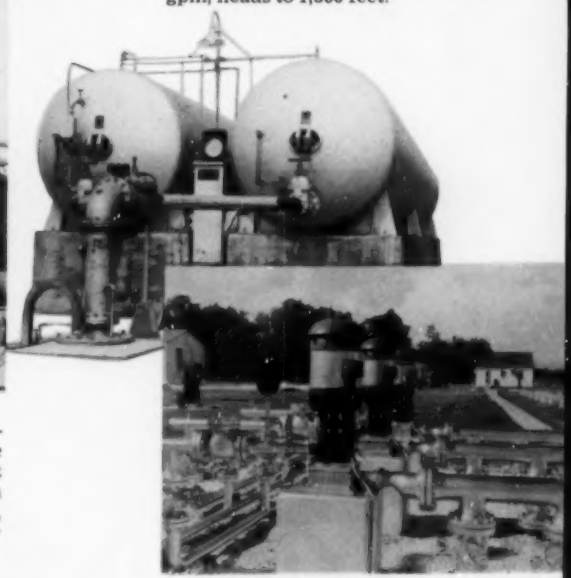


MULTIPLEX PUMPS
Delivering 19,900 barrels per day, these 9 stage DVMX pipeline pumps are diesel driven. This same compact design is available for boiler feed, fuel oil, refinery and all medium-to-high pressure and temperature pumping. Symmetrical construction and special metallurgy allows 450°F operation... speeds to 7000 rpm. Capacities to 2,500 gpm, heads to 4,000 feet.

BILTON PUMPS
This pipeline station, products transfer pump shows the versatility of the close-coupled Bilton design. For all classes of medium and low head service, it takes little space—mounts in any position. Capacities to 2,000 gpm. heads to 457 feet.

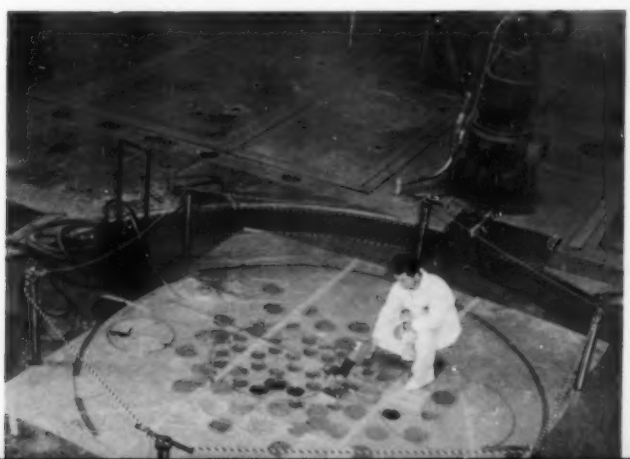
SUBMERSIBLE PUMPS
Nothing but the discharge piping shows above ground on BJ Submersible pump installations such as the water supply unit with storage tanks. Operates completely submerged... no noise, no pump house needed... ideal for deep or crooked wells. Capacities to 20,000 gpm, heads to 1,800 feet.



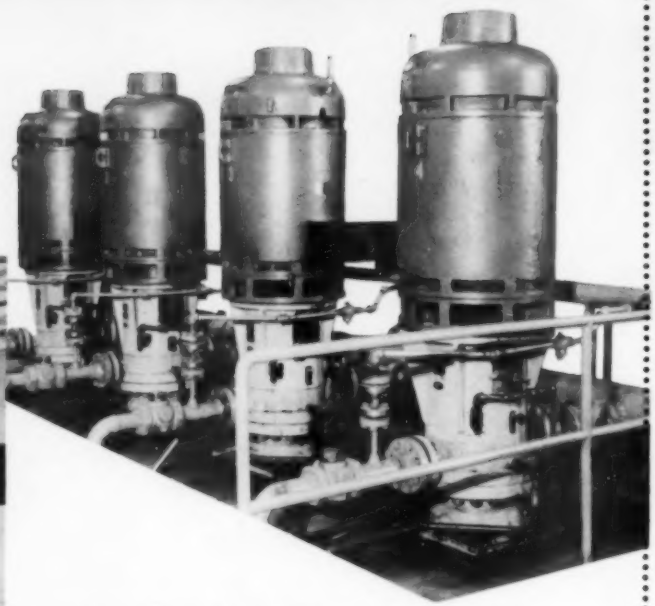


VERTICAL CIRCULATING PUMPS Note the simplified piping and limited space required for these 12 BJ cooling tower pumps in a chemical plant installation. Capacities are available to 50,000 gpm in standard models for drainage, circulating, dewatering and other medium-to-high capacity pumping needs.

VLT-VMT PUMPS
These products loading pumps in a field processing plant are VLT models rated at 200 gpm each. Designed for limited NPSH pumping over a wide temperature range, and with corrosive or non-corrosive liquids. Larger VMT models have capacities and heads in the Vertical Circulating Pump range.

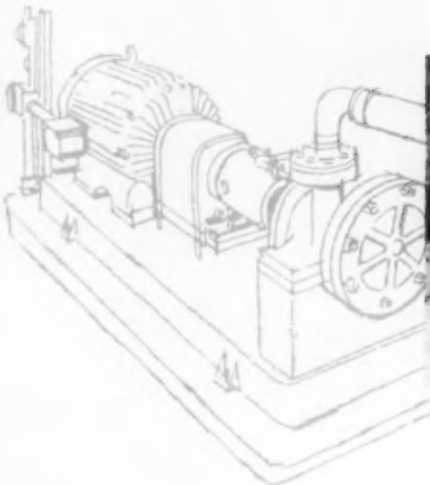


NUCLEAR PUMPS
Handling radioactive liquid sodium at 1000°F, this primary reactor coolant pump is one of eight different BJ units in this atomic power plant. BJ's 87 years of experience have helped meet the high extremes of pressure, temperature and zero leakage required in various types of nuclear pumping.



SM PROCESS PUMPS (Left)
Designed for a wide range of fluid handling jobs, this centerline mounted pump maintains alignment at all temperatures. Single stage models with single or double suction, or two stage models for corrosive or non-corrosive service make this pump ideal for difficult applications such as these in refinery duty.

HYDROPRESS PUMPS (Above)
These vertical, double-case, multi-stage pumps provide high pressure, low volume service for boiler feed, hot or cold refinery pumping, oil well flooding, pipeline service, hydraulic press operation and even primary water supply. Capacities are from 20 to 500 gpm and heads from 55 to 400 feet per stage (to 5,000 psi).



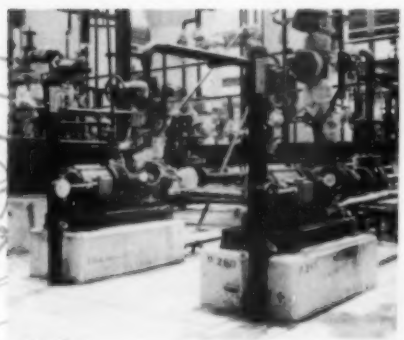


FIGURE PROCESS PUMPS (Left)
A choice of three different stuffingbox designs—packing, mechanical seal or water jacketed—makes this pump particularly useful for general purpose process pumping. Shown here in a West Coast refinery, these moderately-priced pumps are available with capacities to 2,000 gpm, heads to 800 feet and temperatures to 350°F.

COMPLETE INFORMATION is available on all BJ PUMP types shown here. Please specify pump when requesting additional information.

CRYOGENIC PUMPS (Right)
BJ's complete line of standard cryogenic pumps handle liquid methane, oxygen, nitrogen and other fluids even at temperatures approaching absolute zero. Vertical and horizontal models are available for almost any capacity requirement.

BJ
SINCE 1872

Byron Jackson Pumps, Inc.

A subsidiary of Borg-Warner Corporation • P. O. Box 2017, Terminal Annex, Los Angeles 54, California

PRINTED IN U.S.A.

TABLE 9—COMPARISON OF RESULTS—ESTIMATED DOMESTIC DEMAND FOR ALL OILS IN THE UNITED STATES
(Trillions of B.t.u.)

	1959	1960	1961	1962	1963	1964	1965
"Building-Block" approach	20,571	21,421	22,282	23,216	24,195	25,178	26,198
"Share-of-Market" approach	19,738	20,696	21,682	22,692	23,729	24,795	25,888
"Self-Generating" approach	19,483	20,442	21,486	22,587	23,741	24,903	26,157

TABLE 8—ESTIMATED DOMESTIC DEMAND FOR ALL OILS IN THE UNITED STATES
(Self-Generating Approach)

Years	Trillions of B.t.u.
1959	19,483
1960	20,442
1961	21,486
1962	22,587
1963	23,741
1964	24,903
1965	26,157

fords a comparison of the results obtained in Sections A, B, and C.

Forecast of "Nonpetroleum" Share of Future Energy Market, 1959-65

The future pattern of behavior of the nonpetroleum sectors of the energy economy, i.e., natural gas, coal, and water power, is not accurately forecastable. This stems principally from the nature of the political and economic factors determining, among other considerations, the rate of growth by gas and the decline by coal.

There is complete agreement among analysts that marketed natural gas will continue its postwar upward surge and that coal will continue to supply smaller portions of the nation's future energy needs. However, the circumstances surrounding the rise in the use of natural gas represents issues which still remain unresolved. Until the direction of the ultimate solution becomes firm, the growth characteristics of this source of supply will remain in doubt. Under these circumstances, the best possible approach appears to be an analysis of the trend in marketed natural gas in combination with domestic demand for all oils, i.e., a consideration of future levels of fluid hydrocarbons. Thus, estimates of natural-gas consumption may be obtained by deducting from the projections of fluid hydrocarbons the estimates of petroleum consumption previously obtained.

Marketed natural gas is projected at a slower-than-postwar rate reaching a level of 15,140 trillion B.t.u. in 1965. This total will represent 27.5% of the total energy supply and a gain of 35.2% from the current level.

In the case of coal, the industry is beset with difficulties arising out of the fact that markets which have been primary outlets have been declining and in one instance has almost vanished. Perhaps the most significant feature of coal's position in the future energy economy is its growth as a source of energy in the recession-resistant electric utilities.

The impact of dieselization in the past decade has clearly discounted the railroads as a future outlet for coal. From an estimated 20% of total coal consumption, in the period immediately following the close of World War II, deliveries to railroads have declined to the vanishing point. Should the experimental coal-fired gas turbine now in development prove successful, there is a possibility of some recovery of coal consumption by the railroads.

A similar decline but not to the same extent has been registered in coal's domestic retail market. While there is no basis in thinking that there will be a reversal in the direction of this trend, it is likely that future declines will be more moderate than those experienced in the past. Thus, while coal's position in the energy market continues to decline relative to other sources of supply, the rate of decline will be cushioned somewhat by its performance in the electric-utilities market. Coal consumption is expected to decline at a slower than "recent historic rate," reaching a level of 11,839 trillion B.t.u. in 1965. This volume would represent 21.5% of total energy supply and a gain of 12.8% over the current level.

The chief characteristic of the final source of energy supply, namely, water power, is its relative stability over time. While growth in demand for electric energy should continue at a more rapid pace than for total energy, water power's contribution will be limited by the natural physical limitations and political considerations attending the construction and development of hydroelectric units. While water power will undergo a slight expansion in absolute terms, it will supply a smaller share of the future energy market, 3.4% of total energy supply by 1965, a gain of 11.0% from the current level.

Table 10 lists for the 1959-65 period total energy consumption in the United States by sources. Fig. 3 describes graphically the distribution of energy supply by sources.

TABLE 10—TOTAL ENERGY CONSUMPTION IN THE UNITED STATES BY SOURCES (1959-1965)
(Trillions of B.t.u.)

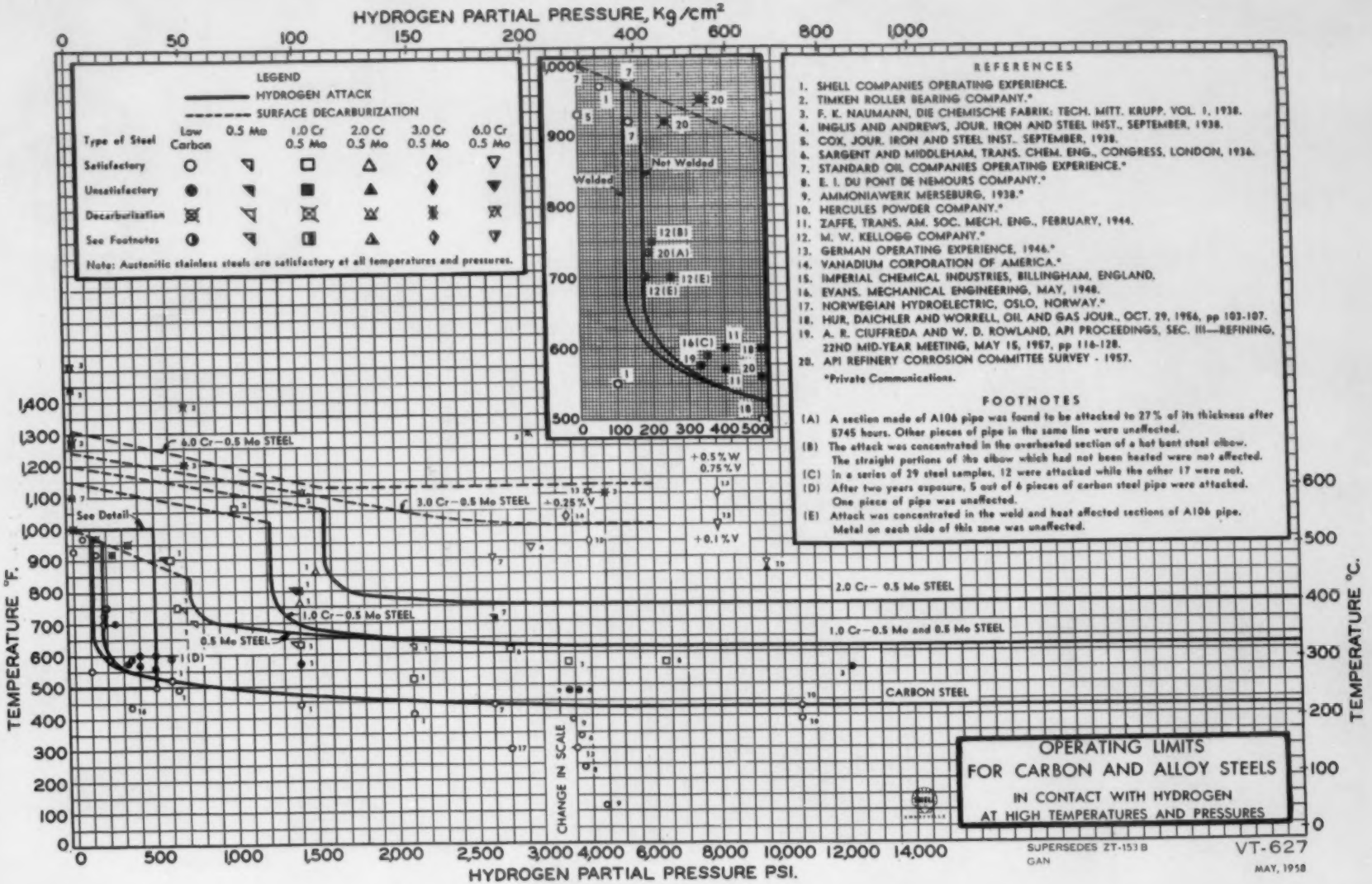
	1959	1960	1961	1962	1963	1964	1965	Annual compound rate of growth 1958-65	Per cent change 1965-58
Petroleum	20,571	21,421	22,282	23,216	24,195	25,178	26,198	4.3	39.4
Natural gas	11,323	11,877	12,498	13,113	13,760	14,433	15,140	4.4	35.2
Coal	9,761	10,060	10,371	10,693	11,026	11,425	11,839	1.7	12.8
Water power	1,726	1,752	1,778	1,805	1,832	1,859	1,887	1.5	11.0
Total	43,381	45,110	46,929	48,827	50,813	52,895	55,064	3.9	31.4

The Best in Refining

NEXT WEEK'S Oil and Gas Journal will feature a special report on the API's important midyear refining meeting in New York. Besides news coverage, the June 1 issue of the Journal will include significant papers on these four topics:

1. Corrosion
2. Processing
3. Electrical power
4. Pilot plants and computing

Look for next week's Journal for the best in refining.



REFERENCES

1. SHELL COMPANIES OPERATING EXPERIENCE.
2. TIMKEN ROLLER BEARING COMPANY.*
3. F. K. NAUMANN, DIE CHEMISCHE FABRIK; TECH. MITT. KRUPP, VOL. 1, 1938.
4. INGLIS AND ANDREWS, JOUR. IRON AND STEEL INST., SEPTEMBER, 1938.
5. COX, JOUR. IRON AND STEEL INST. SEPTEMBER, 1938.
6. SARGENT AND MIDDLEHAM, TRANS. CHEM. ENG., CONGRESS, LONDON, 1936.
7. STANDARD OIL COMPANIES OPERATING EXPERIENCE.*
8. E. I. DU PONT DE NEMOURS COMPANY.*
9. AMMONIAWERK MERSEBURG, 1938.*
10. HERCULES POWDER COMPANY.*
11. ZAFFE, TRANS. AM. SOC. MECH. ENG., FEBRUARY, 1944.
12. M. W. KELLOGG COMPANY.*
13. GERMAN OPERATING EXPERIENCE, 1946.*
14. VANADIUM CORPORATION OF AMERICA.*
15. IMPERIAL CHEMICAL INDUSTRIES, BILLINGHAM, ENGLAND.
16. EVANS, MECHANICAL ENGINEERING, MAY, 1948.
17. NORWEGIAN HYDROELECTRIC, OSLO, NORWAY.*
18. HUR, DAICHLER AND WORRELL, OIL AND GAS JOUR., OCT. 29, 1956, pp 103-107.
19. A. R. CIUFFREDA AND W. D. ROWLAND, API PROCEEDINGS, SEC. III—REFINING, 22ND MID-YEAR MEETING, MAY 15, 1957, pp 116-128.
20. API REFINERY CORROSION COMMITTEE SURVEY - 1957.

*Private Communications.

FOOTNOTES

(A) A section made of A106 pipe was found to be attacked to 27% of its thickness after 5745 hours. Other pieces of pipe in the same line were unaffected.

(B) The attack was concentrated in the overheated section of a hot bent steel elbow. The straight portions of the elbow which had not been heated were not affected.

(C) In a series of 29 steel samples, 12 were attacked while the other 17 were not.

(D) After two years exposure, 5 out of 6 pieces of carbon steel pipe were attacked. One piece of pipe was unaffected.

(E) Attack was concentrated in the weld and heat affected sections of A106 pipe. Metal on each side of this zone was unaffected.

OPERATING LIMITS FOR CARBON AND ALLOY STEELS IN CONTACT WITH HYDROGEN AT HIGH TEMPERATURES AND PRESSURES

SUPERSEDES ZT-153 B
GAN

VT-627
MAY, 1958

HYDROGEN-LIMIT CURVES REVISED

New data provide for useful extensions of 1949 information

IN PROCESSES utilizing hydrogen the combination of hydrogen partial pressure and temperature ultimately reach a point where ordinary carbon steel cannot be used safely because of hydrogen attack. Beyond this point alloy steels must be used. A discussion of the problem and operating limits for carbon and alloy steels was presented in a paper to the API in May 1949.

The limiting curves in this paper were drawn from experimental tests and operating data from plants which were in operation at that time. Since 1949 many new plants have been constructed and a great deal of experience has been gained.

In view of the economic interest in constructing plants from carbon steel to its ultimate safe limit, a panel was appointed by the Subcommittee on Corrosion, of the Committee on Refinery Equipment, Division of Refining of the American Petroleum Institute to survey the industry. The purpose of the survey was to determine the experiences of the plants in regard to the performance of carbon steel in its relation to the limits set forth in the 1949 paper.

Industry helpful . . . The industry has been most helpful in submitting data. The information contained in these reports has been summarized on the chart. In addition to the data from the refineries, a number of references have been added from the literature which were not on the original chart. In the reports by the operating companies a number of references were noted wherein it was stated that samples operating for a few hundred hours at critical conditions might be unaffected.

These references have not been included as such in this report, due to the fact that an incubation period apparently is necessary before permanent interior damage to the grain structure begins. This incubation period will vary and will be dependent on many conditions some of which are: temperature, pressure, type of steel, method of manufacture, ultimate finishing practice, surface condition, etc.

In view of the uncertainties still existing in the knowledge regarding hydrogen attack, it was considered that satisfactory performance should be represented by at least 1 year's service under the stated conditions. Only those satisfactory references in the survey having at least this amount of time were used. As far as unsatisfactory references are concerned, these were plotted as such regardless of whether they had been exposed for short or long periods of time.

The results of the survey indicate that hydrogen attack on ordinary carbon steel is to be expected under conditions outlined in the 1949 API paper. The limiting curves presented in this paper were considered to be adequate. However, recent information has been received concerning failures of welded steel pipe under conditions which fall below the limits for unwelded steel.

It was considered advisable, therefore, to install a curve on the chart to indicate safe operating limits for equipment fabricated by welding.

Accordingly, a new chart has been drawn to incorporate this line. Also a slight adjustment has been made to the limit for unwelded steel reflecting data concerning long-time performance received since issuance of the original chart. The curves for low-alloy steels remain the same as in the original chart:

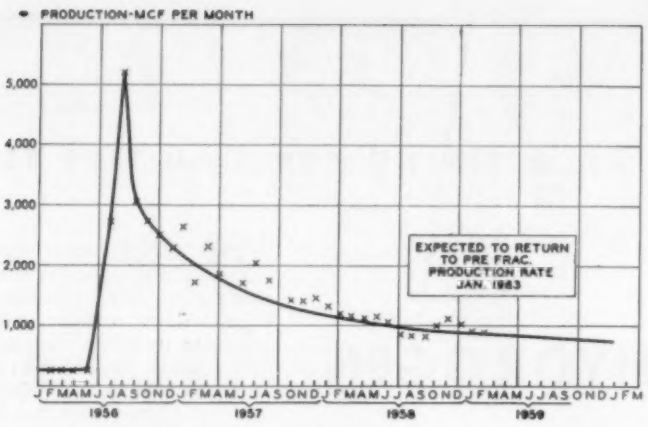
While the survey showed that certain samples of steels have suffered no damage at levels slightly above the indicated carbon-steel curve, this can not be predicted to apply to any piece of steel. Further research work is indicated if steel other than average quality is to be considered for hydrogen service at levels above those now indicated.

Reference

1. G. A. Nelson: "Hydrogenation Plant Steels" API Proceedings, Section 3, Division of Refining. midyear meeting, April 4-7, 1949, pp. 163-172.

Fracturing pays off in eastern United States

BY WENDELL S. MOORE
Columbian Carbon Co.,
Charleston, W. Va.


PRODUCTION-MCF PER MONTH
5,000
4,000
3,000
2,000
1,000
EXPECTED TO RETURN TO PRE FRAC. PRODUCTION RATE JAN. 1963
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M
1956
1957
1958
1959

TYPICAL DECLINE CURVE for an old Big Injun well in West Virginia after fracture. Fig. 1.

PRODUCTION-MCF PER MONTH
7,000
6,000
5,000
4,000
3,000
2,000
1,000
PRODUCTION AFTER FRAC.
ESTIMATED
PROD
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D
6 MO.
12 MO.
18 MO.
24 MO.
30 MO.
36 MO.
42 MO.
48 MO.
54 MO.

TYPICAL DECLINE CURVE of an old Bradford sand well after fracture. Fig. 2.

EARLY REPORTS from eastern United States indicate that fracturing was still too recent to be evaluated properly but appeared to have great merit as a completion procedure.

Since that time the fracturing of newly completed and old wells has become an integral part of the natural-gas and oil industry in the Appalachian area. Substantial and progressive fracturing programs have been in operation for several years, both with new wells and more recently with storage wells. Fracturing of water-injection and producing oil wells in secondary-recovery projects is now accepted completion procedure. The shooting of oil and gas wells is a rapidly disappearing completion procedure except in the shale area of eastern Kentucky and southern West Virginia.

There has been a considerable change in some of the apparent trends in types and sizes of fracture treatments, well-completion methods, and related items of fracture treatments in the area since the end of 1954.

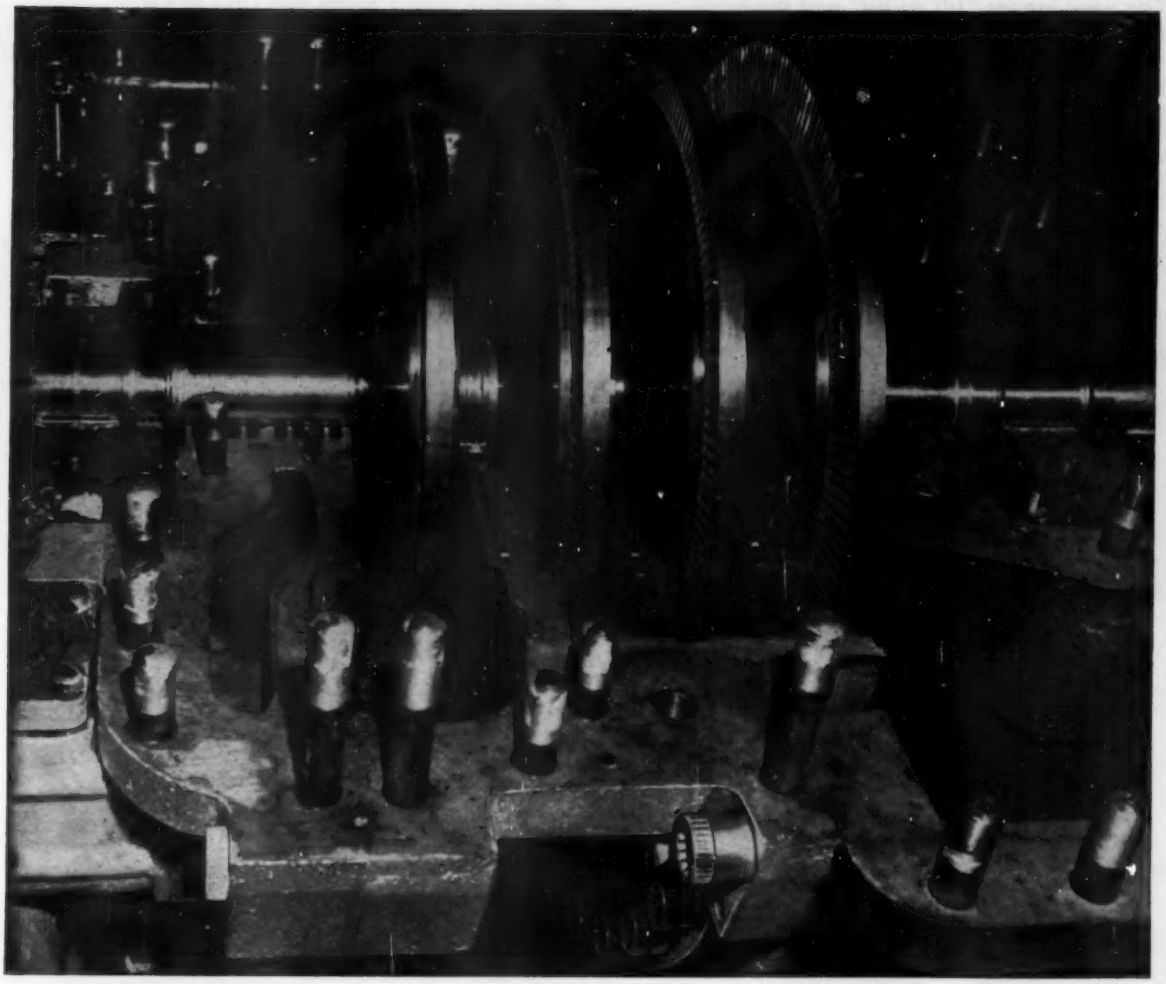
First, for the period 1949-1954, fracturing averaged 59% gel fracture, 36% sand fracture and 5% acid fracture. Gel fracture used a thickened or gelled oil or kerosine as the carrying medium, sand fracture used lease crude or refined crude, and acid fracture used an acid-kerosine gel or an acid gel. In 1958 over 20% of the fracture treatments used water as the carrying medium, either gelled or in its natural state or sometimes as a weak acid (3%).

Secondly, all early fracture jobs used tubing as the injection string, but over 50% of fracture treatments in the Appalachian area in 1958 were performed down 4½, 5½ or 7-in. casing.

By the end of 1954, the average treatment on many formations was 2,000 to 2,500 gal. of fracture fluid while some jobs used 4,500 gal. The only treatments larger than these were the sand fracture treatments in the oil-producing area of the Clinton sand in Ohio. Today, the average treatment for shallow gas-producing horizons is 4,000 to 8,000 gal. of gelled oil or 10,000 to 20,000 gal. of water. Treatments of 12,000 to 20,000 gal. in the deeper horizons of Pennsylvania and West Virginia and the oil-producing Clinton sand areas of Ohio are common. Of course, it follows that if the average treatment size is increasing, the amount of sand injected is also increasing almost proportionally, considering that ungelled carrying fluids will not carry as large a concentration of sand per gallon of fluid. This is offset by the higher injection rates today.

Experience helpful . . . A detailed examination of many fracture treatments performed on the same producing horizon in a particular area indicates that through experience the operators have usually settled upon a very similar size and type treatment which they feel will secure the best results for that particular horizon. Experience has shown that on some producing horizons small treatments will produce as good results after fracture as larger treatments and there has been a trend to reduce the size of treatments in these par-

Presented at the spring meeting of Eastern District API Division of Production, Pittsburgh, April 8-10, 1959, under the original title, "Trends in Fracturing in the Appalachian Area."



THE INSIDE STORY OF A MURRAY HIGH SPEED COMPRESSOR

DRIVE TURBINE REVEALS THE REASONS FOR MURRAY'S UNIVERSAL ACCEPTANCE

A look at MURRAY'S rugged construction from the inside shows the husky shaft and heavy accurately formed discs with generous sized hubs designed to withstand the axial and radial stresses imposed by this type of service.

Large-dimension disc rims receive the specially contoured stainless steel blades with the Murray integral shroud. This insures smooth steam passages with maximum strength.

Short bearing spans insure smooth operation and eliminate the hazard of operating in critical speeds.

A look at the heavy flanges and husky bolting in the actual unretouched shop photo shown above bears out the extreme ruggedness that typifies every feature of Murray construction.

Our nearest representative will gladly help you solve your high speed compressor drive turbine requirements. Just write to Murray Iron Works Company, Burlington, Iowa, for his name.

Murray
TURBINES

MURRAY IRON WORKS COMPANY • BURLINGTON, IOWA
Builders of Steam Power Equipment for Nearly a Century

Can your loader "lift its lip" and duplicate dozer action? No?

Then trade it off without delay! Because you'll miss money-making opportunities right and left without this big-capacity 4-in-1 action building rig sites and lease roads. You have positive "radius control" of dozing depth; plus strength for hard digging! Here, the new International Drott TD-20 4-in-1 is dozing heavy gumbo materials like a full-size blade!

Can your loader grade and strip like a carry-type scraper? No?

Then consider what extra service—and extra-valuable service you would have—with versatile scraper-like action at your fingertips with a moderately-priced 4-in-1! This TD-20 4-in-1 is stripping sticky clay. It can also grade or spread materials with similar accuracy. See how this action can speed constructing tank farm fire walls, for instance.

ONLY A CLAM-ACTION 4-IN-1

can replace up to $100,000 of limited-duty equipment!

Can your loader "bottom-dump" and handle sticky materials? No?

Then retire the "relic" and go modern! You can't choose the materials you excavate. You can't prevent adverse weather that makes materials sticky on rush jobs like digging slush pits! But 4-in-1 bottom-dumping eliminates the sticky materials problem and gives you a vital dumping height plus advantage over ordinary roll-forward buckets.

Move the selector lever—prove to yourself only the clam-action 4-in-1 doubles for a whole spread of "big-ticket" outfits—gives instant changeovers. Compare 4-in-1 capacity and versatility to any single-action loader. Measure exclusive shock-swallowing Hydro-Spring advantages. See your International Drott Distributor for a demonstration—prove you can save up to $100,000 on equipment!

Does your loader have measured, advertised breakout action? No?

It's the genuine and exclusive pry-over-shoe breakout action that enables International Drott 4-in-1's to replace far costlier boom-type rigs on jobs like breaking up and loading out hard, heavy stratified or embedded materials. The new TD-15 4-in-1 exerts the enormous force of 39,200 lbs! Don't let adverse conditions delay rig-site work!

International Harvester Company, Chicago 1, Illinois
Drott Manufacturing Corp., Milwaukee 15, Wisconsin

INTERNATIONAL HARVESTER

INTERNATIONAL®
DROTT®

ticular areas. However, this does not appear to be too common.

The trend in fracturing from its inception to today appears to be more horsepower, more fluid, more sand, and higher injection rates. If this produces better results to offset the increased costs of the larger treatment in comparison to the costs of the smaller treatment, then the larger jobs are justified. However, this horsepower increase will eventually be controlled by the size of the injection string of casing, which today is being reduced generally.

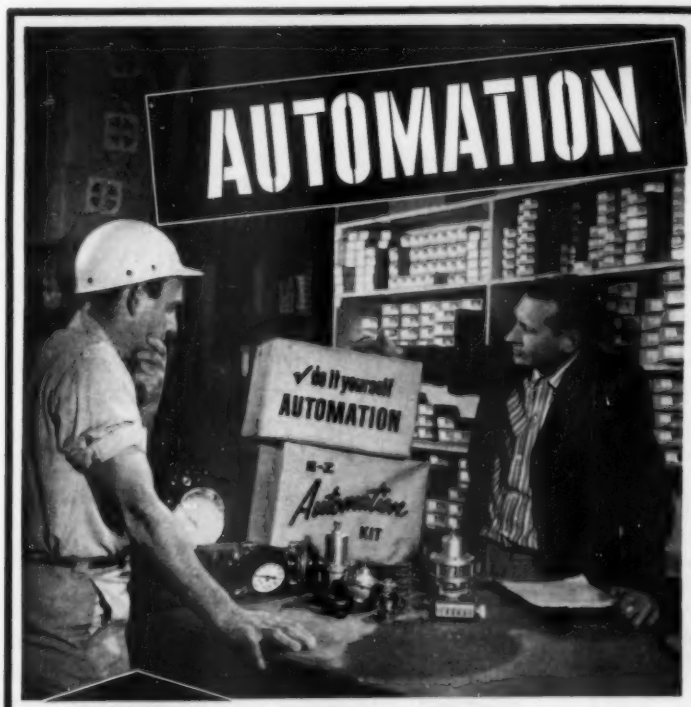
The cheap fracture job of 1954 is not used today. In 1954 a fracture truck with sacked sand and a few carboys of acid performed a fracture treatment and results were satisfactory. For the smallest treatment today a blender, sand truck, fracture truck, and probably an acid truck or acid trailer are used. It is estimated that the average horsepower per fracture job today is 800 to 900% above that when fracturing was in its infancy in 1951 and 300 to 400% above the average horsepower per job in 1954. The price received for gas or crude by the producer has not risen in the same magnitude (scarcely at all in some areas) as the cost of fracturing. Unless results justify these increased costs they must be reduced or a saving must be made in some other area such as reducing completion costs.

Water is cheap . . . The trend to water has reduced fracturing costs. Its use has increased most rapidly in the gas-producing areas. From the viewpoint of cost, safety, and results, it appears to be very satisfactory. In many areas creek water is of sufficient purity to be used without any treatment. In others, creek water must be treated or water must be hauled to the well site. When comparing a cost of $2,500 to $5,000 for kerosine with that of water, which can be pumped from the creek, the water treatment becomes most attractive. This saving in fluid cost can be and often is used to pay for more horsepower and larger treatments. Oil-producing areas with their lease crude available for use have not changed to water as extensively. Another trend to reduce costs is in the drilling and completion phase.

Completion costs cut . . . The use of 5½-in.-o.d. casing as the production string is common today, while in 1954, 7-in. casing as the production string was commonly used. An increasing number of operators are setting 4½-in. casing on top of, or through the producing horizon. Slim-hole completions drilling a 4⅞-in. hole through the sand and cementing in 2½-in. tubing to fracture through are being considered.

Fracturing has changed completion procedures radically in the Appalachian area. In the early days of fracturing, open-hole packers were most commonly used because the great majority of operators did not cement in the producing string.

Most of those that did cement casing either dumped 20 to 50 ft. of cement on bottom and set the pipe down in the cement or cemented with a few sacks and it was found that this completion procedure often would not hold against the high fracture pressure. It is estimated today that on new wells 70 to 80% of the operators are cementing pipe on top of the formation, 10% are cementing pipe through the formation and perforating, while 5 to 20% (depending on the area) are still using the open-hole packer and tubing (many of these are cemented in). More cement is being used on each casing job to insure a leakproof production string due to the realization that a



ODEX

is NOT sold across the counter

You'd be doing it the hard way if you planned your automation "piecemeal" and bought components separately. The easy way—the safe way—is to toss your problems to Odex and relieve your own personnel from the expensive task of dealing with complex and unfamiliar details.

Today, Odex offers the oil industry's only turnkey jobs on automation—from the simplest battery setup to complete field systems operated from a distant control center by any desired communications link.

You CAN automate your lease for profitable operation at a point very near 100% capacity. A single contract with Odex covers engineering, specs, and installation. You get an integrated system, designed to lick your specific production problems on a fast-payout basis. Drop us a letter. No obligation.

ODEX ENGINEERING COMPANY

1410 N. Grant Odessa, Texas FEderal 7-3568

cement failure during fracturing will cost the operator much more than the cost of several hundred feet of casing cemented into the well.

Additives used . . . The use of chemicals to aid in fracturing is another trend in the Appalachian area. Mud acid, a mild acid containing a surfactant, is commonly pumped in ahead of the fracturing fluid to reduce treating pressures, and aid in the treatment. The common procedure today is to displace the mud acid into the formation during the initial breakdown. In exceptional cases the mud acid is removed before continuing with the fracturing treatment. The volume of mud acid will vary from 250 to 2,000 gal. Fluid-loss additives, sesquestering agents to control crystallization of gypsum and associated salts, detergents, surfactants, and other chemicals are also being used in treatments.

Another trend in fracturing in the Appalachian area on both shallow and deep wells is the increased use of multiple grades of sand. A normal multiple-grade treatment today uses 20-40-mesh sand and tails in with 10-30-mesh. The proportions are usually 75 to 90% of 20-40 and 25 to 10% of 10-30. Experiments have been tried reversing this percentage, that is 25 to 10% of 20-40-mesh sand followed with 75 to 90% of 10-30-mesh sand. Some 10-20-mesh round sand and 10-20-mesh angular sand have also been used.

West Virginia

An estimated 550 wells were fractured in West Virginia in 1958. The Big Injun sand in Ritchie, Calhoun, Doddridge, and Gilmer counties accounted for 305 of these treatments —some of these, particularly in the Doddridge County area were very old wells. The Berea, Benson, and Chert-Oriskany horizons were the other formations to be treated extensively. Operators in West Virginia are coming to a better understanding of the limitations of fracturing and are running their casing to the top of the producing horizon or through the producing horizon more frequently and cementing it in. Packers used in fracturing are also being cemented in more frequently.

A large increase in the use of water-fracture and river-fracture or sand-water treatments on both gas and oil wells in the Big Injun sand over previous years indicates the success of these methods. Of the treatments on the Big Injun in 1958, 40% were with water. When fracturing down tubing, 3-in. is now being used rather than the 2-in. of previous years. However, about 40% of the fractures are down 4½, 5½, or 7-in. casing.

The water is used in different forms. Gelled water is used where lower horsepower and high sand ratios are desired. These treatments usually clean up fast and 2 to 3% acid by total volume is sometimes added. Detergents are often used ahead of the fracture treatment.

Water with fluid-loss additives or with detergents is also used. Two to three per cent acid by total volume is sometimes used with this type treatment. The sand concentration is low and more horsepower and higher pressures are common.

Gelled and ungelled oil are still used by operators who believe that initial production from oil treatments are higher and who also believe that faster cleanups are possible.

Fig. 1 shows a typical decline curve for an old Big Injun well in West Virginia after fracture.

Fracturing in southern West Virginia is limited. Extensive Big lime

Increase water-flooding injection rates with TRITON X-100

Extensive use in major producing areas shows that clean-out of injection wells with TRITON X-100 materially raises injectivity indices. It also improves oil recovery rates in water-floods.

Add TRITON X-100 at low levels to injection waters to maintain the favorable injection rates obtained after clean-out. This is effective particularly where produced waters are recycled.

TRITON X-100 is an octylphenoxyethanol (OPE) readily soluble in water and available as a 100% active product. Other Rohm & Haas octylphenoxyethanols, such as TRITON X-102 and TRITON X-165 are effective foaming agents for air drilling and removal of water from drowned gas wells.

Return the coupon today for laboratory and field information on these low-cost injection aids.

A & S C Department, ROHM & HAAS COMPANY
Washington Square, Philadelphia 5, Pa.

Please send me detailed information on the uses of Triton X-100, Triton X-102 and Triton X-165 in water-floods, air drilling and drowned gas wells.

Name_____

Company_____

Address_____

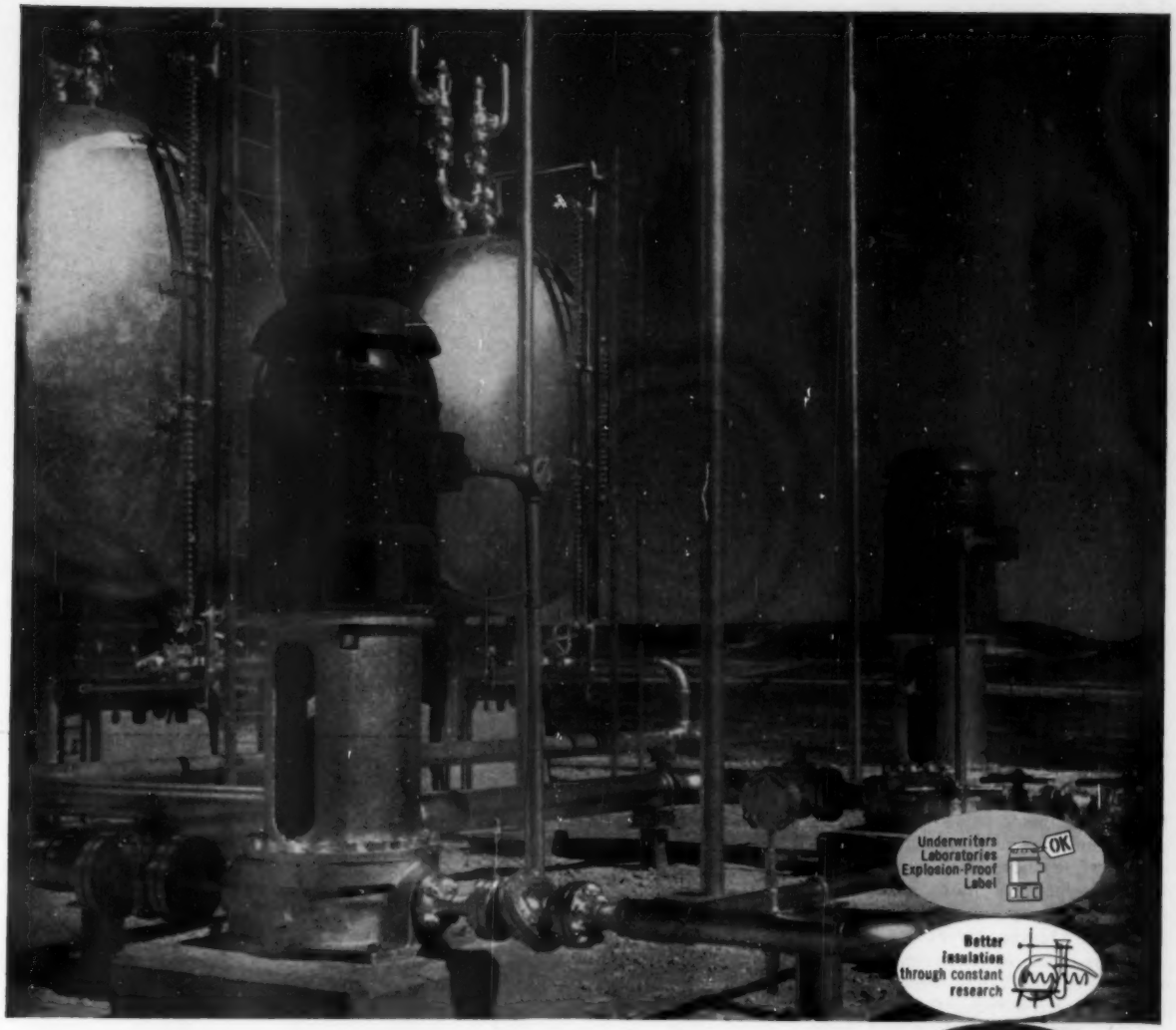
City_____ Zone____ State_____

Chemicals for Industry

ROHM & HAAS COMPANY

WASHINGTON SQUARE, PHILADELPHIA 5, PA.

TRITON *is a trademark, Reg. U. S. Pat. Off. and in principal foreign countries.*



Here's dependable all-weather power

Louis Allis vertical motors are designed for outside petroleum installations

Here's a pump drive keyed to match the particular specifications of the petroleum industry.

Louis Allis vertical solid-shaft motors are explosion-proof for operation in hazardous locations, and corrosion-resistant to ward off both the etching acids in cat-cracking plants and the corroding action of salt spray at sea-exposed installations.

Tough, impervious insulation plus well-designed fully-enclosed construction give ample protection against weather, including dust- or rain-storms.

These motors are no problem for maintenance men, either. Easily mounted and wired up, they require little care afterwards. Tested quality bearings and ample lubrication reservoir keep them trouble-free. The locked bearing construction assures long life.

Louis Allis has a complete line of Explosion-Proof motors, with speeds to 3600 rpm., and sizes up to 600 hp. Ask for Bulletin 800 at your nearby Louis Allis District Office or write The Louis Allis Co., 449 East Stewart Street, Milwaukee 1, Wisconsin.

LOUIS ALLIS

MANUFACTURER OF ELECTRIC MOTORS AND ADJUSTABLE SPEED DRIVES

and shale production has resisted isolated efforts to fracture them and the standard acid treatment in the Big lime and the shooting of the shale are still the accepted procedures. Fracturing of the Berea sand in the southern area is the main activity.

Over 60% of the fracturing done on the Chert-Oriskany in West Virginia was with water. However, the trend to down-casing treatments is not as pronounced as that in Pennsylvania.

Surface-active agents, used for their wetting action to prevent water blockage, and for foaming to aid in faster cleanup, are being tried in water-fractures. A 1% solution of the surface-active agent or mixture of agents is being added to the water and sand.

Ohio

Fracturing in Ohio in 1958, as it was in 1954, is concentrated in the Clinton sand. The large majority of the wells treated are oil wells and lease crude is the base material. As a result, water has not become the major factor in this state as it has in others. Of almost 600 fracture treatments studied only 6½% used water.

Operators who are satisfied with results obtained using low horsepower and low injection rates gel the crude while those desiring a higher injection rate use more horsepower and use plain crude or crude with a fluid-loss additive. Over 75% of the jobs are run in cemented casing, mostly 5½-in. A few liners are run and cemented through the producing horizon and perforated. About 33% of the treatments on the Clinton sand use as much as 20,000 lb. of sand. In 1954 a treatment of a Clinton oil well injected 82,500 lb. of sand with 52,000 gal. of fracturing fluid. Recently, an injection rate of 83 bbl. per minute at 2,000 psi. down 7-in. casing was attained.

Gelled kerosine or gelled diesel fuel is still used on gas wells by most Ohio operators. They feel that it will clean up more quickly. Much smaller treatments and lower injection rates are found in comparison with the lease-oil treatments in the Clinton sand.

Fracturing of gas wells in the Clinton with gelled water and 3% acid is becoming popular in the northeastern part of the state. This is usually down 5½-in. casing set through the sand and perforated.

A recent Ohio survey by one of the major service companies shows a trend toward bigger fracturing jobs, Table 1.

TABLE 1—TREND TOWARDS BIGGER FRACTURING JOBS

Year	Bbl. of sand-laden fluid per job	Total sand vol. per aver. job	Average horsepower per job	Aver. injection rates-bbl./min.
1951	16	300	150	3
1952	25	900	180	3½
1953	87	3,500	190	4½
1954	177	5,700	350	5
1955	258	10,400	478	7
1956	274	10,900	556	12
1957	240	11,500	1,112	21
1958	321	15,400	1,300	24

Pennsylvania

Fracturing in Pennsylvania did not reach any magnitude until the middle of 1954 but since that time has been used at a rapidly increasing rate. The variety of gas and oil-producing horizons have all been fractured to some degree. Oil wells are usually fractured with lease crude while water fracture and sand-water are used on water-injection wells. The shallow gas sands of 3,500 ft. and less are usually fractured with gelled kerosine while the deeper Chert-Oriskany wells are fractured with water—usually in large volumes.

In storage fields, 4½, 5½, or 7-in. casing is either set above or through the producing formation and cemented to the surface. Fracturing is usually done down the casing.

Shallow gas wells are usually completed by cementing 2 or 3-in. tubing with a packer in the top of the producing horizon. The use of 3-in. tubing and occasionally 4½ or 5½-in. casing is becoming more common, allowing higher injection rates and lower treating pressures. Completions cementing 3, 4½, and 5½-in. through one or more producing zones with subsequent perforating and fracturing have been reported. The use of perforation balls to temporarily seal perforations during fracture treatments where casing or tubing is cemented through and perforated is common.

Treatments of the Fifth, Speechley, Balltown-Tiona, Sheffield, Bradford, Elk, and Kane gas-producing sands usually use about 3,000 to 6,000 gal. of gelled kerosine, while the Berea sand is treated with a considerably larger volume of water. It is estimated that over 50% of the fracture treatments in the state in 1958 were performed on the Bradford gas sands, and 99% of these treatments were with gelled kerosine. Fig. 2 shows a typical decline curve of an old Bradford sand well after fracture.

The deeper Chert-Oriskany wells are completed with 5½ or 7-in. casing. About 90% are fractured down the casing and most use water as the fracturing medium. Treatment of this formation will average 12,000 to 20,000 gal. of water-fracture with 10,000 to 20,000 lb. of 20-40-mesh or 20-40-mesh sand and 10-30-mesh sand. From 12 to 18 fracturing pumps with injection rates of 30 to 40 bbl. per minute are commonly used, twenty pumps being the largest number reported on one well. The deepest well treated to date was in excess of 8,400 ft. The largest treatment on record used 24,000 gal. of water-fracture with 25,000 lb. of 20-40-mesh and 10-30-mesh sand. One down-the-casing job was reported in a storage well through 9⅝-in. casing perforated in the Oriskany sand.

New York

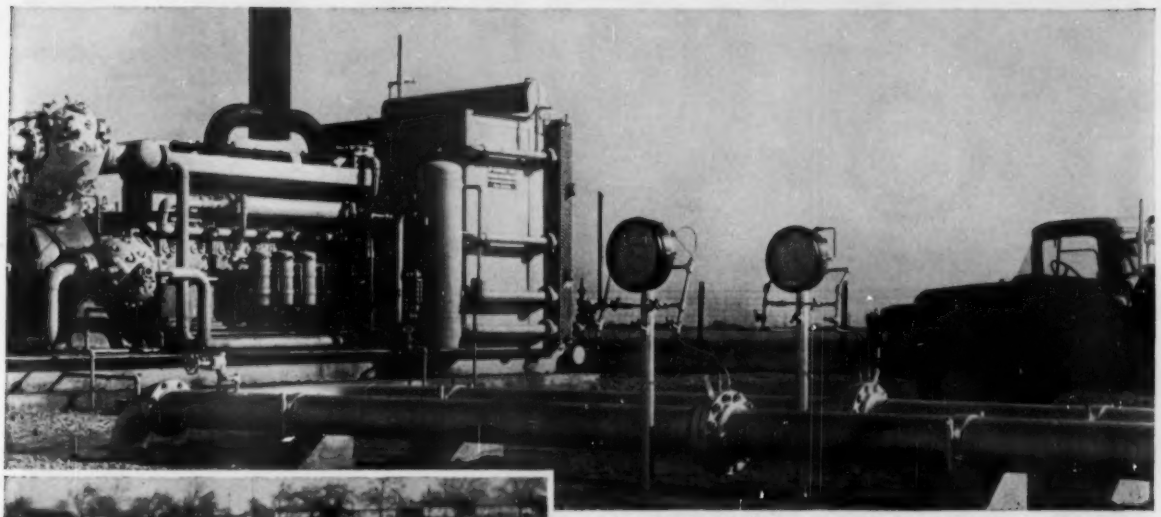
Fracturing in New York is confined mainly to storage wells. Water fracture is used in almost 100% of the treatments and about 95% of the jobs are downcasing. These are mainly confined to the Medina and Oriskany sandstones. Treatments usually average 4,000 to 8,000 gal. of water fracture with 8,000 to 10,000 lb. of 20-40-mesh sand.

Maryland

Fracturing in Maryland is confined to the northwestern part of the state in the Chert-Oriskany horizon with limited activity. Completion methods in common use here are cementing 5½ or 7-in. casing through both horizons and selectively perforating either or both zones. Fracturing treatments usually use water and perforation balls for temporary sealing. Three-inch tubing with a casing packer is used in preference to down-casing treatments with smaller volumes, fewer pumps and lower injection rates than those of the Chert-Oriskany in Pennsylvania.

Acknowledgments

The author thanks those who contributed information for this paper, and is particularly indebted to: Equitable Gas Co., Pittsburgh; Peoples Natural Gas Co., Pittsburgh; Halliburton Oil Well Cementing Co., Duncan, Okla., West Virginia University, engineering experiment station, Morgantown, W. Va., and Dowell Division of Dow Chemical Co.



Foxboro Diaphragm Meters on gas well head measurements at Sunray Mid-Continent's Moore, Oklahoma field. Meters return to zero instantly when flow stops — have no ambient temperature effects, even though temperatures have ranged from −9°F to +105°F.

"the only dry meter with the solid pen-power of a mercury meter"

. . . reports H. H. (Pat) Everett
Sunray Mid-Continent Oil Co.

Fastest zero return of any dry meter on intermittent gas flows. That's just one reason why Sunray Mid-Continent Oil Co. finds the Foxboro Type 37 Diaphragm Meter perfect for gas wellhead flow measurements.

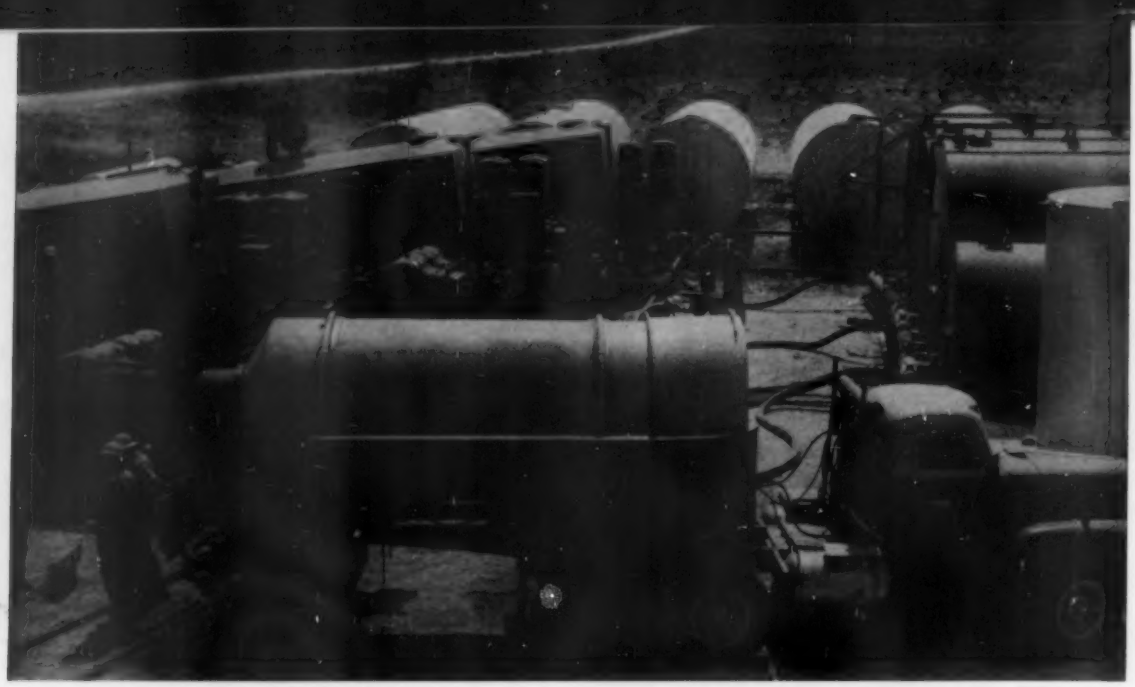
Sunray currently has 47 Diaphragm Meters in operation on gas separator and compressor stations in the Oklahoma City district, with 13 more due to be installed shortly.

District Superintendent H. H. (Pat) Everett also reports that his Diaphragm Meters have never needed calibration since they were installed. And they're completely free from zero drift and ambient temperature effects . . . resulting in the highest sustained accuracy of mercury-less gas flow measurement. No wonder Sunray says the Type 37 outperforms all other dry flow meters!

You'll find Foxboro Diaphragm Meters provide highly accurate, dependable records of all gas flow measurements. Get full details from your nearby Foxboro Field Engineer, or write for Bulletin 7-15A. **The Foxboro Company, 605 Neponset Ave., Foxboro, Massachusetts.**

FOXBORO
REG. U.S. PAT. OFF.

FIRST IN FLOW



MORE THAN 21,000 SACKS of cement have been pumped into three wells in West Texas.

What Phillips learned from

Cementing 136,790 ft. of hole

on its three Pecos County, Texas, deep tests

BY J. O. WOODSON
Phillips Petroleum Co., Midland, Tex.,
AND C. L. FULTON
Halliburton Oil Well Cementing Co., Midland

IN ITS RECENT TRIO of extremely deep wells in Pecos County, Texas, Phillips Petroleum Co. performed 14 primary and more than 25 secondary cementing jobs, many below 20,000 ft.

Success of these cement jobs was the result of careful selection and pretesting of materials and to advance planning of the jobs between the cementing-service company and the operator.

Testing of cement blends for the deep-well jobs led to these conclusions:

1. At bottom-hole temperatures above 260° F., the cement blend should be tested before the job is run.
2. At high temperatures, it becomes more difficult to retard the slurry as weight decreases below 13.5 lb. per gal.
3. Use of silica flour results in a cement blend which has superior qualities for deep, high-temperature squeeze jobs.

The Phillips wells were the 1-EE University (TD 25,340 ft.), the 1A Montgomery (TD 23,400 ft.) and the 1A Harral (TD 19,020 ft.). In cementing them, all materials used are commercially available; no experimental additives were used. Performance of the materials used and the cementing equipment was highly satisfactory even under the most severe well conditions.

When drilling operations were completed and production tests begun on the three wells, a cumulative total of 67,760 ft. of hole had been drilled, and 14 separate strings of casing, totaling 136,790 ft., had been set and cemented.

Condensation of a paper titled, "Deep Well Cementing in Pecos County, Texas," presented at the spring meeting of the Southwestern District, API Division of Production, Midland, Tex., March 4-6, 1959.

Materials

Materials used in cementing can be divided into general classes, depending upon function of the material. Basically, the primary material is cement. Portland cement is the oldest and has been the most widely used type of cement. Although one might assume that a material which has been used as long as portland cement could be altered very little in its properties, this is far from true. When wells were no deeper than 5,000 or 6,000 ft., common portland or construction cement could be used for all cementing operations on these wells.

As wells were drilled deeper with accompanying increases in down-hole temperatures and pressures, it became apparent that common portland cement could not meet all the needs. A cementing service company developed and patented the first retarded set cement which could be pumped to greater depths than the construction cements.

As the industry grew more specialized, cements such as the sulfate resistant types were developed.[1] The many types of portland cement developed led to an API system for classification and the development of API specifications for these cements.

SIW CONTINUOUS SPIRAL PARAFFIN SCRAPER

SIW

NOW FIELD-INSTALLED AT NO EXTRA COST!

Slash your downtime and transportation costs, while installing the scraper that's 3-WAYS BETTER. On orders of 40 or more, we attach them *on location* at the same low price as shop installation.

25c per rod ft. installed

On hundreds of wells, this scraper has *proven* it cuts hot-oiling to the irreducible minimum. Here's why:

1. **MOVES MORE PARAFFIN!** Longer spiral means stronger flow, less foothold for clinging paraffin.

2. **SAVES TIME!** Tapered, protected ends can't hang; run it as fast as you like.

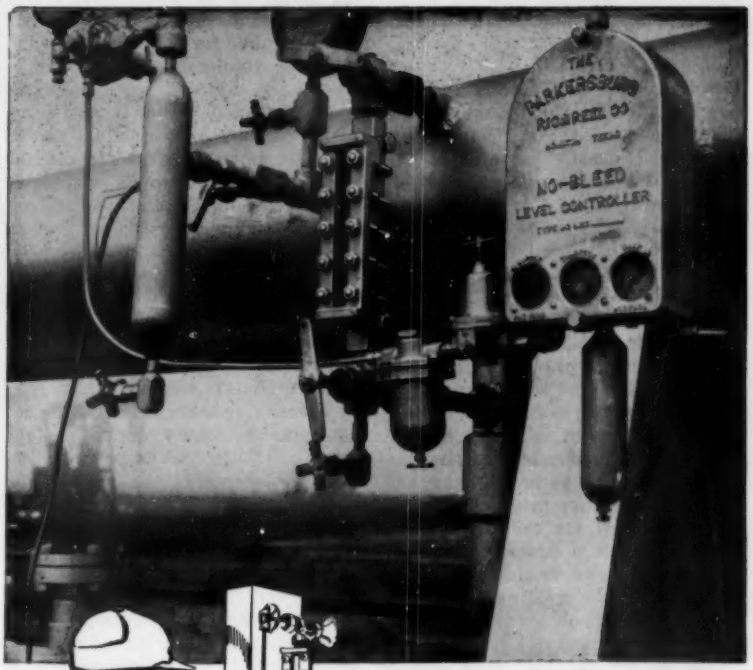
3. **PROTECTS RODS!** Reverse spiral prevents unscrewing. Full-length design stops damaging vibration. No welding on rod.

Write or call us (or the nearest of these dealers) for literature, prices, or information:

MT. PLEASANT, MICH. ... National Supply
STERLING, COLO. ....Farley Machine Wks.
CHASE, KAN. .....Farley Machine Wks.
GREAT BEND KAN....Farley Machine Wks.
MEDICINE LODGE, KAN.
.....Farley Machine Wks.
RUSSEL, KAN......Farley Machine Wks.
BORGER, TEX. ..... Midco
HOBBS, N. M.....Badger Bit & Specialty Co.
SHREVEPORT, LA. .....Noel E. Coburn

SIW **SUNSHINE IRON WORKS**

601 W. Murphy ODESSA, TEX. FEderal 7-6651



"PENBERTHY gages are preferred as accessories by the men who specify and use Parkersburg pressure vessels. They are established as a quality product in the minds of most of our customers. That's good enough for us!"

Outside View of the Inside Story

PENBERTHY GAGES

In addition to assuring *accurate* liquid level readings, Penberthy gages today provide exact determination of color, density, and action in the heart of many processes.

With UNOBSTRUCTED VISIBILITY at temperatures from sub-zero to over 750° F....at pressures exceeding 10,000 psi...Penberthy gages assure more accurate process control — increase protection to vital installations.

Used extensively for fluids ranging from water to highly corrosive chemicals, Penberthy gages are available in bronze, iron, carbon steel, stainless steel, monel, etc....from stock or designed to specification.

Exclusive Penberthy features simplify maintenance...assure stressless seating and alignment of glass...permit servicing without removal of assembly from vessel.

PENBERTHY MANUFACTURING COMPANY
Division of Buffalo-Eclipse Corporation
1242 Holden Avenue **Dept. J** **Detroit 2, Michigan**

Everywhere...you're seeing more
PRODUCTS BY PENBERTHY

- EJECTORS
- INJECTORS
- CYCLING JET PUMPS
- LIQUID LEVEL GAGES
- GAGE VALVES
- SUMP PUMPS

This system now provides for seven classes in regular and sulfate-resistant types.[2 3]

Density control . . . There is a narrow density range to which neat cements should be slurried. For most neat cements, this density range is in the order of 1.5 lb. per gal. with a minimum density of 15.4 lb. per gal. for API Class A cements and approximately 16.0 lb. per gal. for API Class E cements. The proper density range might vary with different brands of cement but will be determined in each case by the water-cement ratio that must be used to provide a pumpable slurry, yet one that will not result in separation of free water upon setting.

When a cement is mixed heavier than the recommended density, its thickening time may be materially reduced or the slurry may be too thick to be pumped. On the other hand, when a cement is mixed lighter than the recommended minimum density, separation of the solid particles from the slurry may occur to the extent that free water pockets will exist within the cement column.[4] The amount of mixing water required will depend to a great extent on the fineness of grind of the cement used.[5]

It is usually desirable to mix a cement to a density equal to or only slightly greater than the mud density used to drill the well. So, the density control of cement slurries over wide ranges is a desirable property. Materials used for density control can be divided into two classes: weighting materials and lightweight materials. A common material used to increase cement - slurry density is drilling - mud barite. Other materials such as iron arsenate, galena, ottawa sand and, most recently, ilmenite ore have been used for this purpose. Ilmenite ore, marketed under the trade name Hi Dense, allows the formulation of heavier cements without the viscosity problems associated with barite.

For light weight . . . Because cement slurries are relatively high on the mud-density scale, more effort has gone into finding suitable materials which can be used to reduce the density of these slurries. One of the first lightweight materials to be added to cements was bentonite. This material is still widely used. Bentonite allows more water to be added to the cement without causing separation of the solid particles.[6 7 8]

The next material to attract a great deal of attention was expanded perlite. This material is normally used with bentonite cement slurries. The addition of the bentonite in the perlite cement blend reduces the flotation of the perlite particles and results in a more uniform slurry. The additional water required for both the perlite and bentonite results in a lighter-weight slurry.

As expanded perlite breaks down under pressure allowing fluid to saturate the interior of the particle, the slurry weight of cement containing this material increases as it is pumped downhole. For this reason, slurry weights on the surface must be carefully controlled to assure the proper weight and viscosity in the well under pressure.[9]

The next development in lightweight slurries was the addition of pozzolanic materials to cement. This resulted in a cementing material having the advantages of density control in the range of 13.5 to 15.5 lb. per gal. without the susceptibility to deterioration by corrosive waters experienced with bentonite cements.[10 11] Other properties such as perforating characteristics and expansion on setting were also better.

The most recent development in density control is the use of diatomaceous earth.[12 13 14 15] This material is an additive containing very little aluminum. It permits a tremendous amount of water to be added to the cement slurry without separation of the solid particles. This material, known commercially as Diacel D, was used for density control in cementing the three deep wells to be discussed in this paper.

Retarding setting time . . . The slow-set cements available from the cement industry cannot be expected to meet all of the conditions in oil-well cementing. However, they are excellent starting materials for many modifications. These modifications normally include retardation and water-loss control, as well as density control.

A number of materials have been used as cement retarders. One of the first of these was common sugar. Although an excellent retarder, this material had many disadvantages. Other retarders used with varying degrees of success have included oxidized cellulose, sodium tannate, dextrin pyrogallic acid, and calcium lignosulfonate.

The most recent development in the field of retarders is the tongue twister, carboxymethyl hydroxyethyl cellulose (CMHEC).[12 13 16] Like many other retarders, this material incorporates other desirable properties along with retardation. Most retarders are also dispersants. On the other hand, CMHEC helps suspend the cement particles, and thus is a very good material to use with weighted cements. This material also imparts effective low - water - loss characteristics to cement slurries as indicated by its trade name, Diacel LWL.

Many retarders reverse their action and become accelerators at high concentrations. As CMHEC does not have this characteristic, it could be used to successfully retard cements for the extremely deep wells drilled in Pecos County. This material has been used for cement retardation in other deep, high-temperature wells such as the Richardson & Bass-Mecom-Freeport-Humble-LL&E-State 2414, Well No. 1-L in South Louisiana[17] and Shell Oil Co. 5 Rumberger well recently drilled near Elk City, Okla.[18]

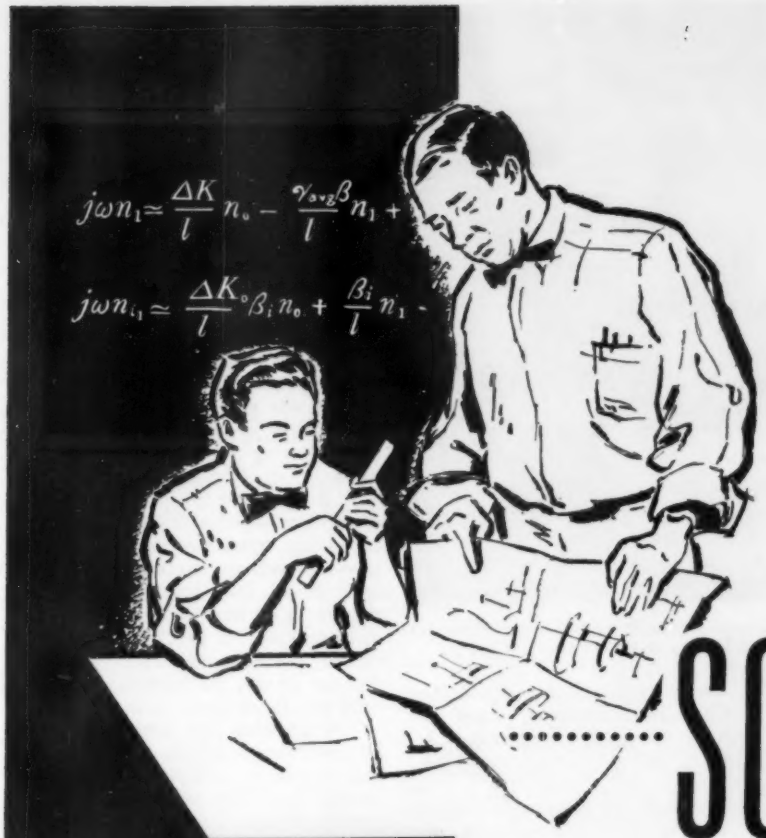
Temperature problem . . . Oil-well cements must be retarded under deep-well conditions because increased temperature and pressure reduce the thickening time or pumpability of the slurry. In addition, high temperatures and extreme pressures have other effects upon cement slurries placed and set under these conditions. An API Mid-Continent District Study Committee made studies of the effects of high temperatures and pressures on the strengths of hardened oil-well cement slurries.[19 20]

These studies show that cements attain lower early strengths when cured above a certain maximum temperature, or that they lose strength with time at temperatures above this critical temperature. Any cement cured above this critical temperature reaches a maximum strength and then begins to lose strength with time. The point at which this maximum strength is reached depends upon the curing temperature.

It was also found that an increase in the pressure at which the cement is cured decreased the amount of strength retrogression and increases the temperature at which this retrogression begins.

The amount of aluminum present in the cement mixture has an effect on this strength retrogression. The retrogression is lessened and begins at a higher temperature with small tricalcium aluminate content. It has been found that the addition of moderate amounts of silicon dioxide to the cement mix will reduce or eliminate this strength retrogression.[21] Again, the aluminum content of the admix should be small to obtain the maximum benefit.

Two important low - aluminum sources of silicon dioxide of a particle size usable in oil-well cements are silica flour, which is mined in southern Oklahoma, and diatomaceous earth. Of these two materials, silica flour is probably superior because it requires much less water. Silica flour is recommended for cements where



SOLVED

. . . all but the necessary High Pressure Research Tools

and there's where Autoclave Engineers, Inc. comes into the picture to help you reach your objective.

For more than a decade, we have been designers and producers of high pressure equipment . . . valves, reactors, stirred autoclaves, pumps, pressure vessels and related equipment.

While your project is in the planning stage, it will pay you to consult with us on the engineering design and most economical manufacturing procedures for the high pressure research equipment you need. We can help you!

AUTOCLAVE ENGINEERS Designs and Builds High Pressure-High Temperature Equipment Such As—

Valves, Fittings, Pumps, Compressors, Reactors, Stirred Autoclaves

Complete Package Systems (Including Panel Board For Control and Instrumentation) Such As—

Corrosion Testing Vessels

Diffusion Bonding

Isostatic Pressing

Shock Tube Systems

AUTOCLAVE ENGINEERS, INC

2944 WEST 22nd STREET, ERIE, PENNSYLVANIA

THIS IS ONLY A SMALL PART of the equipment needed to mix and pump the 21,073 sacks of cement used in three Pecos County deep tests.

density requirements are 14.5 lb. per gal. or greater. For the lighter cements, it is necessary to use diatomaceous earth with its capacity for larger amounts of water, with the realization that certain sacrifices in strength must be made. Slow-set cements rather than portland cements were used as starting materials for the deep cement jobs in Pecos County because of their low tricalcium aluminate content.

Water-loss control . . . Water-loss control is important for any cement slurry but becomes a must for deep-well cementing, and, generally speaking, for most successful squeeze-cement operations.[12 22 23 16] Inasmuch as more water is retained in a low-water-loss cement slurry, the water-to-cement ratio is more constant and the thickening time is more predictable. Reliable thickening times are a necessity in deep-well cementing.

As a cement slurry loses its water, it becomes viscous. Higher pump pressures are then required to keep the slurry moving. These increased pump pressures may in turn rupture the formation resulting in lost circulation. Also, viscous and drier cement slurries have a greater tendency to channel because they do not flow as readily as a slurry containing the proper water-to-cement ratio.

Severe water loss from a cement slurry can result in a flash set. Flash sets do not normally occur because of good mud cakes. A flash set when cementing an extremely deep well could result in loss of the well. Use of a low-water-loss cement on any well will result in increased fillup because of the small amount of water lost from the slurry during placement behind the casing.

New squeeze . . . The use of CMHEC in cement has resulted in a new squeeze - cementing technique.[24] Because of its success, the technique is in common use in some areas. It was reasoned that the use of a low-water-loss cement on anticipated high-pressure squeeze jobs would minimize dehydration of the slurry permitting the entire interval of perforations to be covered. Initial pumping rates are held somewhat lower than on conventional squeeze jobs. Hesitation pumping may be necessary to obtain the desired squeeze pressure. If the desired pressure is not obtained, cement is left opposite the perforations rather than overdisplaced.

This method allows the use of larger volumes of cement without the danger of premature dehydration at the perforations and the resulting necessity to attempt to reverse out the major portion of the cement.

Excessive thickening times are of no disadvantage as long as good squeeze pressures are developed. On the contrary, they allow more working time to insure safe placement and a successful job.

Field Operations

All slurries used in these operations were formulated and tested in Phillips Petroleum Co.'s technical services division laboratory in Bartlesville, Okla. On the more critical cement jobs, these tests were rerun under the same conditions at Halliburton Oil Well Cementing Co.'s laboratories in Odessa, Tex. All tests were made under standard API specifications for testing oil-well cements.

Tests at both laboratories were made with identical testing equipment which can simulate actual well conditions as far as temperatures and pressures are concerned. When the results of these tests did not agree, each laboratory was furnished actual samples of water, cement, and additives that would be used. The tests were then rerun until results were verified. In testing materials for some of the deeper cement jobs, it was necessary to change the formulation several times to get a slurry having the desired characteristics.

It is advisable to pretest the cement blend which will be used in any cementing operation where bottom-hole temperatures are expected to be 260° F. or above. A sample of the cement to be used on the job should be submitted for test, and this particular shipment of cement retained for use on this job if thickening-time tests are satisfactory. Actual samples of the additives and mixing water to be used should also be submitted for the laboratory tests. It has been observed that different brands of cement, and even separate lots or shipments of the same brand, may be inconsistent in their behavior at extremely high temperatures. This is not generally cause for concern as long as the aforementioned precautions are taken and these peculiarities are known.

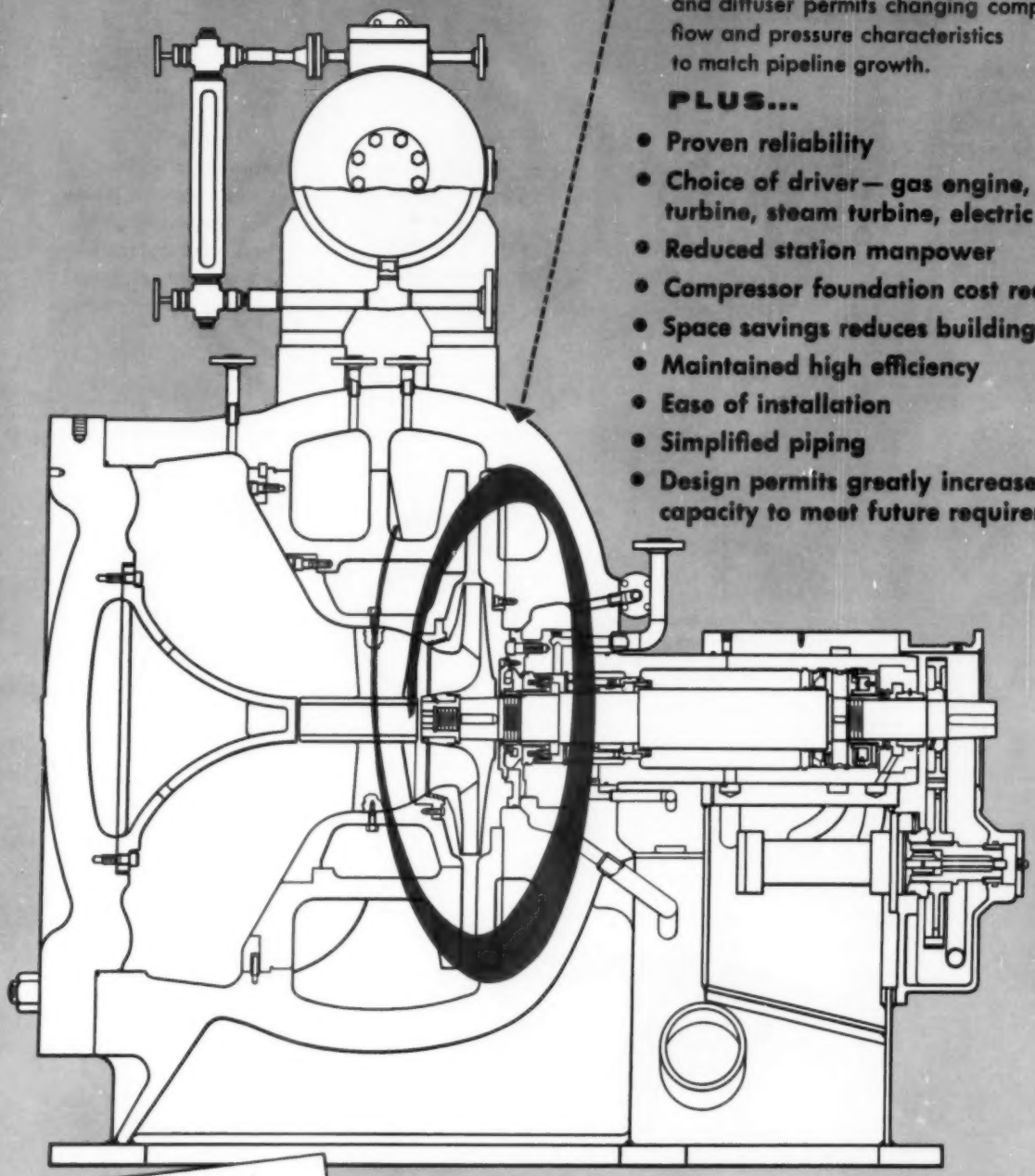
The 1A Harral

Fig. 1 shows data on all casing strings set and cemented in the 1A Harral. Routine cementing practices were used to set 85 ft. of 26-in. casing to 36-in. hole and 1,560 ft. of 20-in. casing in 24-in. hole. A 12¼-in. hole was then drilled to 10,529 ft. where a string of 9⅝-in. casing was set. The 20-in. surface casing had been set to allow for the possible necessity of running 13⅜-in. intermediate casing on this wildcat well. The results of further drilling had proved this tentative casing string would not be required.

At the time 9⅝-in. casing was set, the drilling-mud weight was 10.4 lb. per gal. Inasmuch as it was desired to place cement behind the entire casing string and some danger of lost circulation was known to exist, a 10.5-lb. per gal. cement slurry was used. The blend consisted of 1,500 sacks of regular portland cement with 84,600 lb. of Diacel D, which is equivalent to 60% by weight of the port-

DE LAVAL
CENTRIFUGAL
COMPRESSORS

Built to Meet Today's and Tomorrow's Requirements



Readily interchangeable impeller and diffuser permits changing compressor flow and pressure characteristics to match pipeline growth.

PLUS...

- **Proven reliability**
- **Choice of driver—gas engine, gas turbine, steam turbine, electric motor**
- **Reduced station manpower**
- **Compressor foundation cost reduced**
- **Space savings reduces building costs**
- **Maintained high efficiency**
- **Ease of installation**
- **Simplified piping**
- **Design permits greatly increased capacity to meet future requirements**

See our exhibits at the International Petroleum Exposition, Tulsa, Oklahoma May 14-23 and 5th World Petroleum Congress New York Coliseum June 1-5

DE LAVAL *Centrifugal Compressors*

DE LAVAL STEAM TURBINE COMPANY
Nottingham Way, Trenton 2, New Jersey

DL447

DE LAVAL
CENTRIFUGAL COMPRESSORS

Serving these leading pipeline companies now total over 400,000 HORSEPOWER

Columbia Gas System
Atlantic Seaboard Corporation

Southern Counties
Gas Company of California

Southern California
Gas Company

Shown here are trademarks of leading pipeline companies. They all use dependable DE LAVAL centrifugal compressors to help provide the continent's expanding gas requirements.

Trunkline Gas Company

Westcoast
Transmission Company Limited

Texas Eastern
Transmission Corporation

Northern
Natural Gas Company

El Paso Natural Gas Company

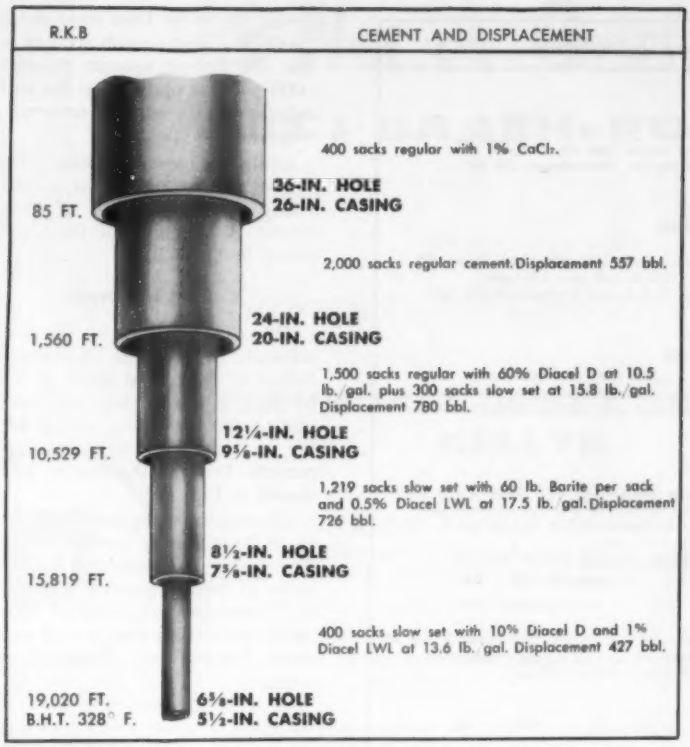
United Gas Pipe Line Company

Transcontinental
Gas Pipe Line Corporation

DE LAVAL *Centrifugal Compressors*

DE LAVAL STEAM TURBINE COMPANY
Nottingham Way, Trenton 2, New Jersey

DL447


R.K.B
CEMENT AND DISPLACEMENT
400 sacks regular with 1% CaCl2.
36-IN. HOLE
26-IN. CASING
85 FT.
2,000 sacks regular cement. Displacement 557 bbl.
24-IN. HOLE
20-IN. CASING
1,560 FT.
1,500 sacks regular with 60% Diacel D at 10.5 lb./gal. plus 300 sacks slow set at 15.8 lb./gal. Displacement 780 bbl.
12¼-IN. HOLE
9⅝-IN. CASING
10,529 FT.
1,219 sacks slow set with 60 lb. Barite per sack and 0.5% Diacel LWL at 17.5 lb./gal. Displacement 726 bbl.
8½-IN. HOLE
7⅝-IN. CASING
15,819 FT.
400 sacks slow set with 10% Diacel D and 1% Diacel LWL at 13.6 lb./gal. Displacement 427 bbl.
19,020 FT.
B.H.T. 328° F.
6⅛-IN. HOLE
5½-IN. CASING

HERE IS WHAT Phillips used in casing and cementing their 1A Harral in Pecos County, Texas. Fig. 1.

land cement. When mixed, this blend produced approximately 8,250 cu. ft. of 10.5-lb. per gal. cement slurry.

This lightweight slurry was followed with 300 sacks of slow-set cement for additional strength around the bottom joints of the casing. The cement was displaced with 780 bbl. of mud with a maximum displacement pressure of 800 psi. Although circulation was lost during the last 30 bbl. of displacement, contaminated cement was circulated and hard cement was found 50 ft. from the surface.

Intermediate string . . . An 8½-in. hole was drilled to 15,863 ft. where it became necessary to set a protective string of 7⅝-in. casing. Increased mud weights were necessary as drilling progressed. A blowout occurred at 14,589 ft. which required 18.2-lb. per gal. mud to bring under control. Further drilling to the 7⅝-in. casing point required 17.5-lb. per gal. mud which was normally gas cut.

During this period there was a delicate balance between the mud weight required to contain the formation and that weight which would break down the formation. In fact, it is believed there was an overlap, in that certain zones were breaking down at the same time others were unloading into the well bore. The 7⅝-in. casing was set to contain the high-pressure gas zones which were encountered and to allow the mud weight to be decreased to combat the lost-circulation problem.

The estimated temperature at 16,000 ft. was 280° F. extrapolated from logged temperatures at shallower depths. This logged temperature would correspond to a circulating temperature of 244° F. and a bottom-hole static temperature of 320° F. The cement blend recommended for this string of casing was slow-set cement with 60 lb. of barite per sack and 0.5% Diacel LWL slurried to 17.5 lb. per gal. Laboratory tests showed this slurry to have thickening time in excess of 4 hours and a 24-hour compressive strength greater than 1,500 psi.

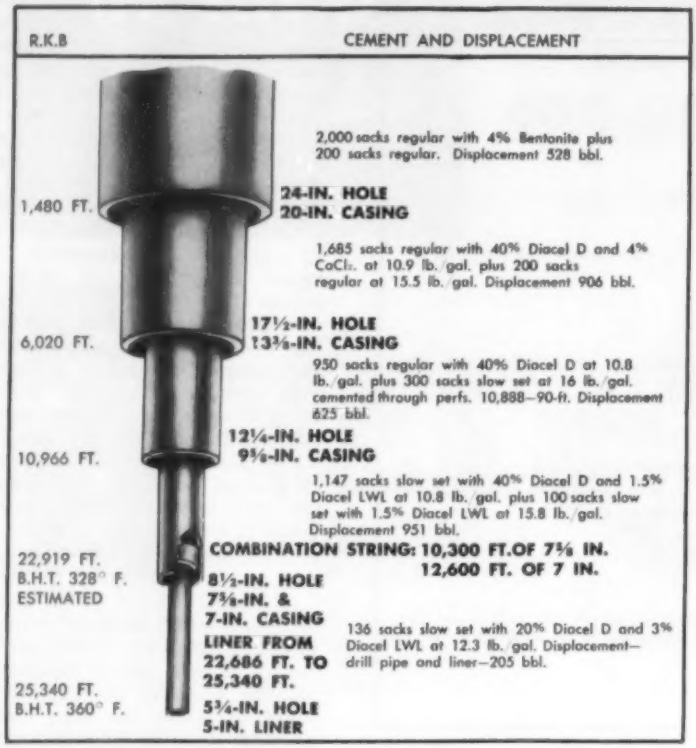
Although 40 lb. of barite per sack of cement would normally be recommended to obtain a 17.5-lb. per gal. slurry, the exact density requirements for this job were not known. The slurry containing the larger amount of barite could be controlled over a wider range of densities without causing separation of the solid particles from the slurry. The 7⅝-in. casing was set at 15,819 ft. and cemented with only partial returns after landing and while mixing and displacing. However, a temperature survey located the top of the cement at 9,905 ft. inside the 9⅝-in. casing.

On the bottom . . . The 1A Harral was bottomed at 19,020 ft. The logged temperature at total depth was 296° F., which corresponds to a circulating temperature of 260° F., and a static temperature of 328° F. A full string

TABLE I—SECONDARY CEMENTING OPERATIONS IN THE 1A HARRAL

Type of job—	Retainer depth* (ft.)	Perforations (ft.)	Materials used	Surface squeeze pressure (psi.)	Remarks
Squeeze	18,462	18,533-18,534	50 sx slow-set cement, 0.3% Diacel LWL, 8.5 millicuries iodine radioactive, slurry weight 15.7 lb./gal.	8,000	Squeezed 35 sx, reversed 15 sx.
Squeeze	18,160	18,198-18,200	50 sx slow-set cement, 0.3% Diacel LWL, slurry weight 16 lb./gal.	8,000	Squeezed 40 sx, reversed 10 sx.
Squeeze	15,795	15,833-15,835	Same as above.	8,000	Squeezed 30 sx, reversed 20 sx.
Dump bailer	18,740	18,820-18,900	2 sx slow-set cement, 0.5% Diacel LWL.	....	Dumped on top of bridge plug.
Dump bailer	18,000	18,370-18,423	2 sx slow-set cement, 2% Diacel LWL.	....	Dumped on top of bridge plug.
Dump bailer	17,500	17,888-17,938	2 sx slow-set cement, 05% Diacel LWL.	....	Dumped on top of bridge plug.
Dump bailer	16,000	16,630-16,670	Same as above.	....	Dumped on top of bridge plug.
Squeeze	15,753	15,770-15,790	50 sx same as above.	7,400	Squeezed 45 sx, reversed 5 sx.
Dump bailer	15,686	15,700-15,720	2 sx same as above.	....	Dumped on top of bridge plug.
Dump bailer	15,900	....	Same as above.	....	Dumped on top of bridge plug.
Dump bailer	14,750	15,654-15,674	Same as above.	....	Dumped on top of bridge plug.

*All squeeze jobs were performed through drillable retainers or drillable production packers.


R.K.B
CEMENT AND DISPLACEMENT
2,000 sacks regular with 4% Bentonite plus 200 sacks regular. Displacement 528 bbl.
1,480 FT.
24-IN. HOLE
20-IN. CASING
1,685 sacks regular with 40% Diacel D and 4% CaCl2 at 10.9 lb./gal. plus 200 sacks regular at 15.5 lb./gal. Displacement 906 bbl.
17½-IN. HOLE
6,020 FT.
13⅜-IN. CASING
950 sacks regular with 40% Diacel D at 10.8 lb./gal. plus 300 sacks slow set at 16 lb./gal. cemented through perfs. 10,888–90-ft. Displacement 625 bbl.
12¼-IN. HOLE
10,966 FT.
9⅝-IN. CASING
1,147 sacks slow set with 40% Diacel D and 1.5% Diacel LWL at 10.8 lb./gal. plus 100 sacks slow set with 1.5% Diacel LWL at 15.8 lb./gal. Displacement 951 bbl.
COMBINATION STRING: 10,300 FT. OF 7⅝ IN.
12,600 FT. OF 7 IN.
22,919 FT.
B.H.T. 328° F.
ESTIMATED
8½-IN. HOLE
7⅝-IN. &
7-IN. CASING
LINER FROM
22,686 FT. TO
25,340 FT.
136 sacks slow set with 20% Diacel D and 3% Diacel LWL at 12.3 lb./gal. Displacement—drill pipe and liner—205 bbl.
25,340 FT.
B.H.T. 360° F.
5¾-IN. HOLE
5-IN. LINER

FOUR STRINGS OF CASING and a liner were used in the Phillips 1-EE University well. Fig. 2.

of 5½-in. casing was set to total depth and cemented with 400 sacks of slow-set cement with 10% Diacel D and 1% Diacel LWL slurried to 13.6 lb. per gal. The mud weight at this time was 13.3 lb. per gal.

This was the only cement job out of the 14 primary cement jobs performed on the three wells which required remedial squeezing. Although the top of the cement outside the 5½-in. casing was located at 12,040 ft. by temperature survey, pressure developed in the annulus and a small gas flow indicated that channeling of the cement had occurred. The small clearance between the 5½-in. casing and 6⅝-in. open hole over a 3,200-ft. interval is believed to be the primary cause of this cementing failure.

Remedial squeezes in three separate intervals were performed before production tests were begun in the well. A low-water-loss cement was used on each job. Each squeeze job was performed through a drillable retainer and was successful on the first attempt. Surface connections and cement discharge lines were tested to 13,000 lb. before each job. In each case, the desired squeeze pressure of 8,000 psi. was obtained at the surface and the excess cement reversed out without difficulty.

Additional cement squeeze jobs and plugbacks were performed during the testing and completion of the 1A Harral. A summary of these jobs is shown in Table 1.

1-EE University

The 1-EE University, located 11 miles northwest of the 1A Harral, was drilled to the record depth of 25,340 ft. During the drilling and completion of this well, four strings of casing and one liner were set and cemented. Data on the cement jobs are shown in Fig. 2.

The surface string consisted of 1,480 ft. of 20-in. casing run in 24-in. hole. The casing was cemented with 2,000 sacks of regular portland cement with 4% bentonite and followed with 200 sacks of portland cement with no additives. Cement was circulated to the surface.

A 17¼-in. hole was then drilled to 6,020 ft. where a string of 13⅜-in. casing was set. This casing string was cemented with 1,685 sacks of regular portland cement with 40% Diacel D and 4% calcium chloride mixed to 10.9 lb. per gal. The lightweight slurry was followed with 200 sacks of regular portland cement slurried to 15.5 lb. per gal.

Circulation was lost when displacement of the cement was started after releasing the top plug, and there were no returns throughout the remainder of the job. The cement was displaced with a maximum pressure of 500 psi., and the top of the cement outside the 13⅜-in. casing was located at 3,895 ft. by temperature survey. Prior to running casing, there had been lost

TABLE 2—SECONDARY CEMENTING OPERATIONS IN THE 1-EE UNIVERSITY

Type of job—	Retainer depth* (ft.)	Perforations (ft.)	Materials used	Surface squeeze pressure (psi.)	Remarks
Plug back 22,829-22,575	.....	.....	50 sx slow-set cement, 22½% silica flour, 2% Diacel LWL, slurry weight 14.5 lb./gal.	.....	Plugged 24 joints tubing with cement. Laboratory analysis of sample from dry blend indicated approximately 1% Diacel LWL in sample.
Plug back 21,827-22,215	.....	22,310-22,500	Same as above.	.....	Reversed 10 sx.
Plug back 19,465-19,143	.....	19,540-19,770	Same as above.	.....	Reversed 6 sx.
Squeeze (Stage 1)	13,960	14,000-14,060	100 sx slow-set cement, 0.3% Diacel LWL, slurry weight 16.5 lb./gal.	1,000	Squeezed 100 sx, cleared perforations with 10 bbl. of water.
Squeeze (Stage 2)	13,960	14,000-14,060	Same as above.	5,000	Squeezed 88 sx, spotted 2 sx on top of packer and reversed out 10 sx of mixture.
Plug back 13,210	.....	13,248-13,320	75 sx slow-set cement.	.....	Reversed out 5 sx. Did not obtain plug.
Plug back 13,210-12,800	.....	13,240-13,320	Same as above.	.....	Reversed out 5 sx. Successful plug with top of hard cement 12,850 ft.
Plug back 8,610-8,340	.....	8,650-8,685	Same as above.	.....	Reversed 4 sx.

*All squeeze jobs were performed through drillable retainers or drillable production packers.

It's Not A Grief Stem

IF IT'S A BAASH-ROSS KELLY

Choice of
Square or Hexagonal Kelly...

"TRUBORE" UPSET SQUARE KELLYS

From alloy steel selection to anti-gall treatment each manufacturing step is quality controlled to assure long kelly life. Because of their heavy walls, "Trubore" kellys have very little flexibility. Therefore, the joint alignment is held to unusually close tolerances to eliminate risk of "working" at the joints, thus minimizing joint failures. Added length at top and bottom upsets allows recutting threads for added life.

B-R square kellys are made in various styles including the plain type. Special lengths, cross sectional dimensions or upset designs using any type of steel are available on order.

"TRUBORE" HEX KELLYS

Because this kelly can be used without change for both regular or pressure drilling it is widely used as the standard for all drilling operations.

The Baash-Ross hex kelly has these advantages:

- Smoother running (machined to shape)
- Greater resistance to bending*
- More circulation area*
- Stronger in torque*
- Greater tensile strength*

*Based on comparable square and hex kellys.

Facilities are available in the United States for reconditioning worn hex or square kellys, and for stubbing by the Baash-Ross pressure weld method.

PROTECT your kelly investment — use Baash-Ross Kelly Drive Bushings.

BAASH-ROSS DIVISION
OF JOY MANUFACTURING COMPANY
GENERAL OFFICES: 5306 CLINTON DRIVE, HOUSTON, TEXAS

AREA OFFICES:
Houston, Texas, Odessa, Texas, Dallas, Texas; Long Beach, Cal.; Casper, Wyoming; Oklahoma City, Okla.; Olney, Ill.; Calgary, Alberta, Canada; New York, N. Y.

FOREIGN OFFICES:
Monte Carlo, Monaco; Mexico City, Mexico; Greenock, Scotland; London, England; Paris, France; Caracas, Venezuela; Buenos Aires, Argentina; Rio de Janeiro, Brazil; Tokyo, Japan

BAASH ROSS JOY

HUSKY RIGS

for

DEEP WELL WORK

The Cooper Self Propelled "T" and "TC" Model Rigs with the Cooper Skytop 66 ft. Doubles Derrick are the most completely portable big rigs built.

The Cooper Skytop 66 ft. Derrick will pull and rack pipe in doubles as fast, or faster than conventional 90 ft. derricks, yet it weighs thousands of pounds less and costs less. It has ample capacity for the deepest servicing or workover—racks over 13,000 feet of 2-⅞" O.D. pipe in doubles.

Fast and safe hydraulic erection—tong drive included at no extra cost.

Mast roading dimensions: length 35 feet, height 13 feet 5 inches or less, depending on rig, width 8 feet.

COOPER "T" MODEL RIG

The Cooper "T" Model Rig is built to take the roughest oil field service.

Engineered for proper weight distribution on all axles. Tandem front axles available where required.

Unitized vehicle and drawworks frame construction reduces weight and height, increases rigidity and stability.

Has every modern feature—torque converter and full torque shifting transmission. Quiet running torque tube drives that require no adjusting.

There are no high speed chains.

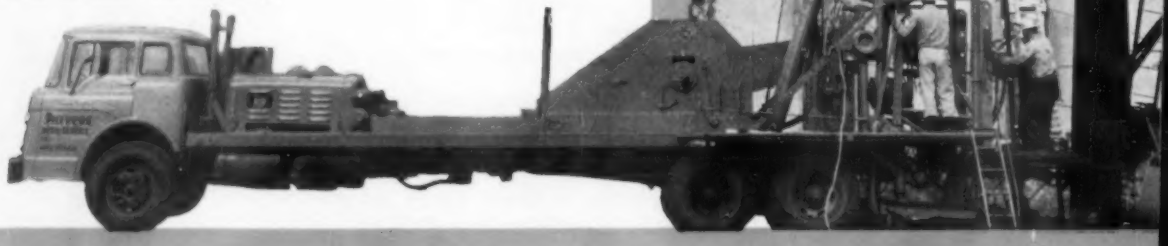
Hydraulic Power Steering—Air Brakes.

Big, comfortable cab, located away from well—is protected from oil spray—un-obstructed driver vision.

A wide choice of heavy duty industrial engines up to 300 horsepower, gas or diesel.

Big brakes—up to 42" diameter with 10" wide face—air and water cooled.

Full air drum clutches—self adjusting.



Cooper "T" Model Single Drum Workover Rig with Cooper Skytop Doubles Derrick on a deep workover job located on the Gulf Coast.

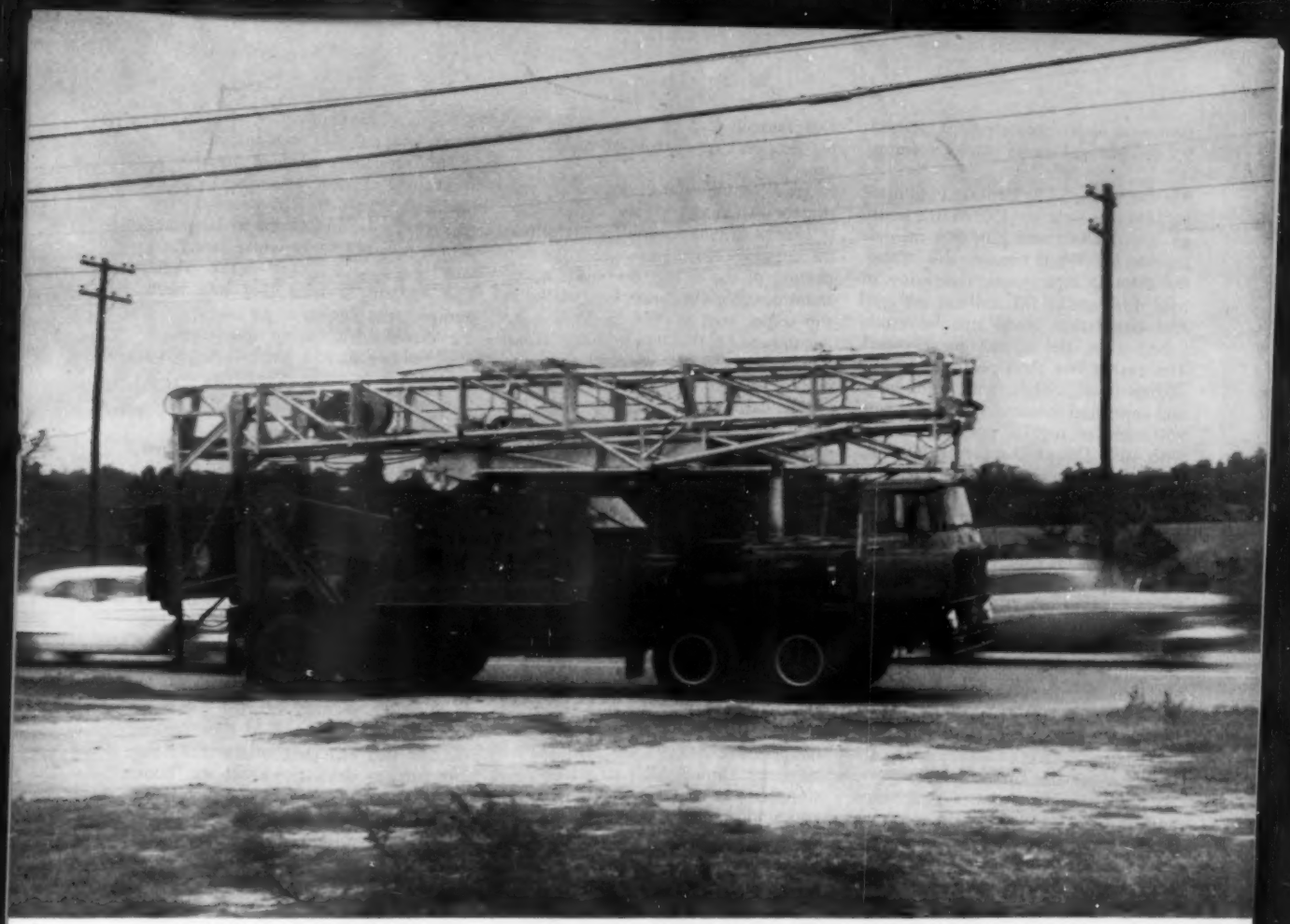
FRED E. Cooper, Inc.

P. O. BOX 1890 TULSA, OKLA.

Branches: Houston, Odessa, Olney

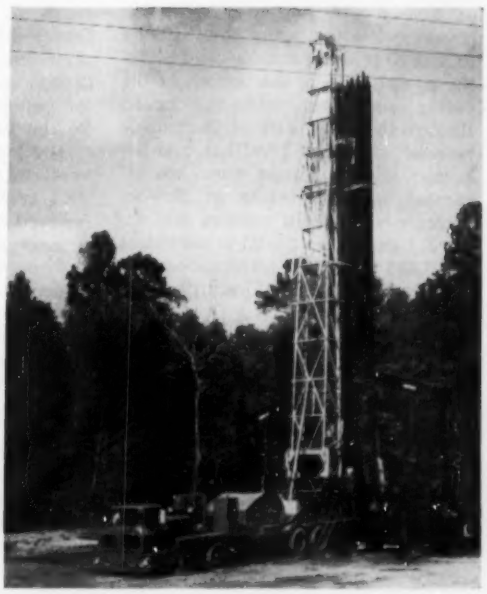
ORIGINATOR OF

Mobile Winch Units



Cooper "Licks" Highway Problems with a Completely Legal Doubles Rig

The Cooper model TC self propelled unit, equipped with a Cooper skytop for servicing the deepest wells, has licked the problems of moving a doubles rig over the highways. Lighter weights, axled right for your job, and legal dimensions add up to a truly portable machine that *costs less* than so called portable rigs. The Cooper model TC is easy to keep clean because it's uncluttered. It's rugged enough to withstand heavy oil field use. Get full details from a Cooper salesman or write Box 1890, Tulsa, Okla.



FRED E. Cooper, Inc.

P. O. BOX 1890 TULSA, OKLA.

Branches: Houston, Odessa, Olney

ORIGINATOR OF MOBILE WINCH UNITS

returns at approximately 6,000 ft. with 9.8-lb. per gal. mud while reaming.

9⅝-in. string . . . Drilling continued in 12¼-in. hole to 10,996 ft. where an intermediate string of 9⅝-in. casing was set. While running this casing, the floating equipment, consisting of two differential fill collars, plugged and circulation could not be established after the casing was landed. The casing was then perforated from 10,888 to 10,890 ft. with eight holes and cemented through these holes with 950 sacks of regular portland cement with 40% Diacel D mixed to 10.8 lb. per gal., followed with 300 sacks of neat slow-set cement.

Approximately 300 cu. ft. of cement slurry was lost to the formation during displacement. The top of the cement outside the 9⅝-in. casing was located at 8,130 ft. by temperature survey. As this cement top was only a few feet above a zone of interest for future production tests, it was desired to recement at this point. The casing was perforated from 8,088 to 8,090 ft. with eight holes, and attempts were made to establish circulation back to the surface.

Circulation could not be established, and the perforations were squeezed with 200 sacks of slow-set cement mixed with water containing radioactive iodine. A gamma-ray log located radioactive cement from 8,065 to 8,127 ft. after the cement in the casing was drilled out and the perforations tested.

The floating equipment was then drilled out, and a bridge plug was set a few feet below the bottom of the 9⅝-in. casing. Before running 9⅝-in. casing, an 8½-in. reduced hole had been drilled to 11,556 ft.

Circulation was established around the bottom three uncemented lengths of casing by setting a retrievable packer below the perforations 10,888 to 10,890 ft. and pumping mud below the packer, around the bottom of the casing and back into the casing through these perforations. A drillable retainer was set at 10,920 ft. and the bottom joints of casing were then cemented with 100 sacks of slow-set cement. No squeeze pressure was applied. Cement was found in the casing at 10,885 ft. and the perforations were tested satisfactorily before drilling the retainer.

Record string . . . Drilling continued on the 1-EE University until May 26, 1958, at which time the well passed the existing depth record of 22,570 ft. When a depth of 22,919 ft. was reached, a protection string consisting of approximately 10,300 ft. of 7⅝-in. and 12,600 ft. of 7-in. casing was set and cemented. This cement job was the deepest ever performed up to that time.[26]

This combination casing string was run for two reasons. First, better safety factors in tension could be obtained by utilizing 7⅝-in. casing in the top portion of the string. Secondly, maximum possible clearance was needed in the upper part of the cased hole to accommodate the tapered drill string which was to be used for further drilling.

The casing was cemented with 1,147 sacks of slow-set cement with 40% Diacel D and 1.5% Diacel LWL slurried to 10.8 lb. per gal. This lightweight slurry was followed with 100 sacks of slow-set cement containing 1.5% Diacel LWL and slurried to 15.8 lb. per gal. At the time of running this string of casing, the mud weight was 10.2 lb. per gal., the Marsh funnel viscosity was 51 seconds and the water loss was 4.4 cc.

Thickening times for the cement blends selected were determined in the laboratory before the job was performed. From a logged bottom-hole temperature of 295° F., which was recorded 8 hours after circulation was stopped, the bottom-hole circulating and static temperatures were assumed to be 260° and 328° F., respectively. Thickening times were determined using these temperatures and an assumed bottom-hole pressure of 16,000 psi. Under these conditions, thickening times of 5 hours for the lightweight slurry and 4 hours 30 minutes for the neat cement were obtained.

The tests on the neat cement slurry were run with only 0.5% Diacel LWL mixed to 16.3 lb. per gal. However, the subsequent use of 1.5% Diacel LWL in the neat cement had no detrimental effects. The slurry could not be mixed above 15.8 lb. per gal. because of the high concentration of Diacel LWL but attained the desired strength upon setting as evidenced by the hard cement found in the bottom joints of casing when the floating equipment was drilled out.

The top of the cement was located at 4,100 ft. by temperature survey. This 18,819-ft. column of cement is believed to be the longest ever placed in a single stage.

Prior to this job, specially manifolded storage tanks, normally used for hydraulic fracturing, were placed on location, and 10.2-lb. per gal. mud was stored in these calibrated tanks. The volume of mud necessary to displace the cement was calculated, taking into consideration a compressibility factor for the mud to be used. The cementing trucks were manifolded to these storage tanks so that the desired number of pumps could continue to displace the cement as soon as the entire volume had been mixed.

This procedure made it possible to accurately control the displacement rate and eliminate the necessity for each operator to attempt to keep accurate measurements while switching tanks on his individual pump truck. The amount of mud that had been pumped was known at all times while the cement was being displaced. A total volume of 951 bbl. was required to displace the cement and bump the plug which followed the cement.

Five-inch liner . . . Drilling continued to 25,340 ft. At this point, a 5-in. liner was run and cemented in 5¾-in. hole. The liner was cemented with 136 sacks of slow-set cement mixed with 20% Diacel D and 3% Diacel LWL slurried to 12.3 lb. per gal which yielded a total slurry volume of 340 cu. ft. Although returns were lost with one-half of the slurry still inside the liner, the cement was displaced without difficulty.

A good primary cement job was obtained, and the top of the liner at 22,686 ft. was tested satisfactorily. As no further drilling was to be done and the liner was to be perforated near bottom, no neat cement was used around the bottom joints. It is preferable to complete through Diacel D cement rather than neat cement because of its better perforating characteristics. A number of cement plugbacks were performed on this well during subsequent testing. Details of these jobs are included in Table 2.

1A Montgomery

The 1A Montgomery drilled to 23,400 ft. The four separate strings of casing which were set and cemented in this well are shown in Fig. 3. The first string was 1,424 ft. of 20-in. surface casing set in 24-in. hole and cemented with 1,662 sacks of regular portland cement with 4% bentonite, followed with 300 sacks of regular portland cement. The bentonite cement was slurried to 14 lb. per gal. and the neat cement slurried to 16 lb. per gal. Cement was circulated to the surface.

A 17½-in. hole was drilled to 5,046 ft. and 13⅜-in casing set at this depth. As circulation was lost while cementing the 13⅜-in. casing in the 1-EE University well, it was decided to cement this string in the 1A Montgomery in two stages. A stage-cementing collar was set at 3,421 ft. The bottom stage was cemented with 302 sacks of regular portland cement with 40% Diacel D and 4% calcium chloride slurried to 10.8 lb. per gal., followed with 400 sacks of regular portland cement slurried to 15.4 lb. per gal.

INCREASE PROFITS WITH REDA Submergible PUMPS

REDA GIVES YOU THESE COST SAVING FEATURES AND DOES THE JOB BETTER!

- **Lower cost for installation, operation and maintenance.**
- **250 to 18,000 BPD capacities**
- **Depths to 10,000 ft.**
- **Corrosion-resistant construction**
- **Long life — dependable service**
- **A complete line to meet pumping requirements**

and

INVESTMENT COST IS FAR LOWER WHEN YOU CHOOSE REDA FOR YOUR PUMPING NEEDS.

Write or call for more information. Reda engineers will be pleased to assist and help plan your operations.

SIGN OF QUALITY SUBMERGIBLE REDA PUMPS

REDA PUMP COMPANY
BARTLESVILLE, OKLAHOMA
Manufacturers of submergible motors and pumps for over 35 years — for oil, brine and water wells, gasoline and jet fuel —

what does

$$\triangle F/A = \triangle p$$

mean to you?

(Continued on next page)

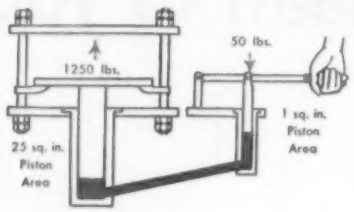
(Continued from preceding page)

$$\triangle F/A = \triangle p$$

. . . is the mathematical expression for Pascal's Principle which states that: "pressure applied to a confined fluid is transmitted uniformly to all areas of the confining fluid."

In the drawing below, notice how a relatively small pressure of 50 pounds applied to the 1 sq. in. piston raised 1,250 pounds on the 25 sq. in. cylinder. Pascal discovered how to multiply the muscles of man a thousand fold! Today, the light touch of a woman's toe against a foot pedal smoothly yet quickly slows and halts a two ton automobile.

Pascal's Principle had been known for hundreds of years when a man by the name of Sven Nordstrom successfully applied the principle to

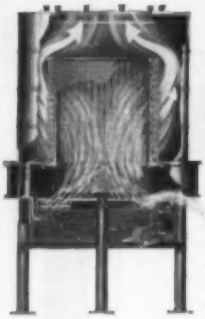


Here is a demonstration of Pascal's Law. A given pressure of 50 lb lifts 1250 lb over an enlarged area of 50 to 1 ratio

create a most unusual innovation in valves—his invention, the lubricated plug valve. In the most elementary terms, this valve is simply an old fashioned plug cock (used since the days of Pompeii) to which Nordstrom ingeniously applied the Principles of Pascal.

LOW PRESSURE DROP OIL BATH AIR FILTER

for turbocharged engines, compressors, blowers



The Air-Maze Type LPD (Low Pressure Drop) oil bath air filter makes possible low static pressure loss operation without any outside energy or moving parts whatever. As a result, it offers particular benefits in cleaning of intake air on turbocharged stationary engines, since pressure losses of silencers, piping, elbows and air cleaners are additive.

Built specifically for larger range air flows, it offers resistances as low as 1" of water. As shown in the illustration, oil-scrubbing of intake air is accomplished by reversing the conventional oil and air current. Thus, low pressure loss is attained without sacrifice in efficiency, or oil washing action. There are no moving parts. Service is limited to occasional draining and cleaning of an oil sump.

Available in sizes from 800 to 16,500 cfm. Write for Bulletin LPD-1055. **The Air-Maze Corporation, Dept.**

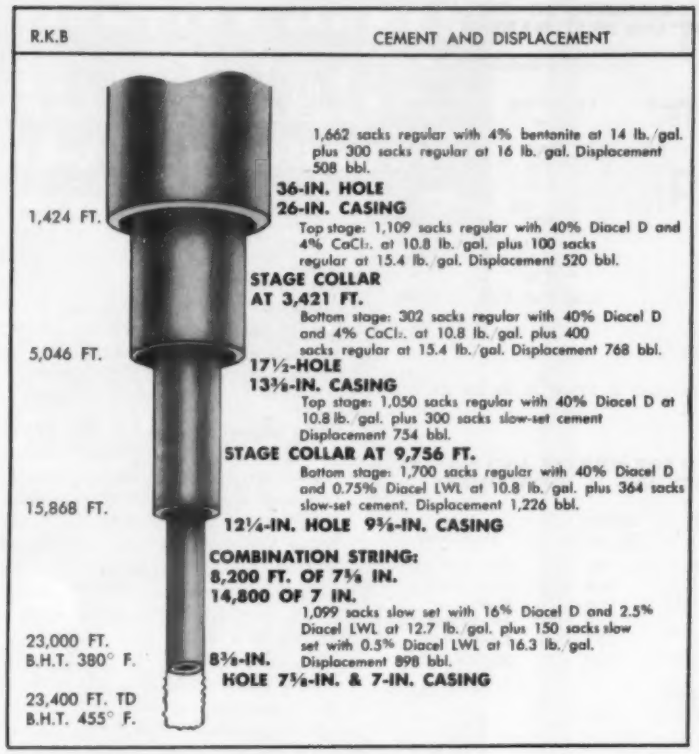
THE LIBERTY NATIONAL BANK & TRUST CO. OKLAHOMA CITY

The right background for competent service. Ask for Morrison Tucker Grady Harris Paul McGuire Jim Berry

The Liberty

National Bank and Trust Co. of Oklahoma City

Member Federal Deposit Insurance Corporation


R.K.B
CEMENT AND DISPLACEMENT
1,662 sacks regular with 4% bentonite at 14 lb./gal. plus 300 sacks regular at 16 lb. gal. Displacement 508 bbl.
36-IN. HOLE
26-IN. CASING
1,424 FT.
Top stage: 1,109 sacks regular with 40% Diacel D and 4% CaCl2 at 10.8 lb. gal. plus 100 sacks regular at 15.4 lb. gal. Displacement 520 bbl.
STAGE COLLAR AT 3,421 FT.
Bottom stage: 302 sacks regular with 40% Diacel D and 4% CaCl2 at 10.8 lb. gal. plus 400 sacks regular at 15.4 lb. gal. Displacement 768 bbl.
5,046 FT.
17½-HOLE
13⅜-IN. CASING
Top stage: 1,050 sacks regular with 40% Diacel D at 10.8 lb. gal. plus 300 sacks slow-set cement Displacement 754 bbl.
STAGE COLLAR AT 9,756 FT.
Bottom stage: 1,700 sacks regular with 40% Diacel D and 0.75% Diacel LWL at 10.8 lb. gal. plus 364 sacks slow-set cement. Displacement 1,226 bbl.
15,868 FT.
12¼-IN. HOLE 9⅝-IN. CASING
COMBINATION STRING:
8,200 FT. OF 7⅛ IN.
14,800 OF 7 IN.
1,099 sacks slow set with 16% Diacel D and 2.5% Diacel LWL at 12.7 lb. gal. plus 150 sacks slow set with 0.5% Diacel LWL at 16.3 lb. gal.
23,000 FT.
B.H.T. 380° F.
8⅜-IN. Displacement 898 bbl.
HOLE 7⅞-IN. & 7-IN. CASING
23,400 FT. TD
B.H.T. 455° F.

THE 1A MONTGOMERY was completed with 400 ft. of open hole below the last casing string. Note the bottom-hole temperature. Fig. 3.

The stage collar was opened and approximately 170 cu. ft. of excess cement circulated out. Circulation was continued for 8 hours. The top stage was then cemented with 1,109 sacks of regular portland cement with 40% Diacel D and 4% calcium chloride, followed with 100 sacks of regular portland cement. Again, the respective slurry weights were 10.8 and 15.4 lb. per gal.

Cement was circulated to the surface on the second stage. No lost returns were experienced on either stage. The neat cement was used on both stages for added strength around the bottom joints of casing and at the stage collar.

Another record string . . . The setting and cementing of 15,868 ft. of 9⅝-in. casing has been described in The Oil and Gas Journal.[4] A 12¼-in. hole was drilled to 15,868 ft. and an 8¾-in. reduced hole to 16,000 ft. The mud weight at the time of running casing was 10.3 lb. per gal. A stage-cementing collar was set at 9,756 ft. The bottom stage was cemented with 1,700 sacks of common portland cement with 40% Diacel D and 0.75% Diacel LWL slurried to 10.8 lb. per gal., followed with 364 sacks of slow-set cement slurried to 15.4 lb. per gal.

The stage collar was opened and approximately 200 cu. ft. of excess slurry circulated to the surface. After ports in the stage collar were opened, partial returns were lost while circulating out the excess cement. When the lower-stage cement had attained its initial set, the top portion of the casing was cemented through the stage collar with 1,050 sacks of regular portland cement with 40% Diacel D, followed with 300 sacks of neat slow-set cement. Cement was circulated to the surface on this top stage.

The Diacel LWL was used in the first-stage cement primarily for a thickening-time control agent rather than for fluid-loss control. The fluid loss of this particular blend lies within the modified water-loss range obtainable with bentonite and calcium lignosulfonate slurries[7] instead of the low-water-loss range normally associated with a Diacel LWL slurry.

Hot hole . . . The last string of casing to be set in the 1A Montgomery was the combination string of 7⅝-in. and 7-in. set at 23,000 ft., which at that time erased the record then held by the 1-EE University with a similar tapered string set to 22,919 ft.

This well had a considerably higher bottom-hole temperature at 23,000 ft. than the 1-EE University at this depth.

TABLE 3—SECONDARY CEMENTING OPERATIONS IN THE 1A MONTGOMERY

Type of job—	Retainer depth* (ft.)	Perforations (ft.)	Materials used	Surface squeeze pressure (psi.)	Remarks
Squeeze	22,970	Open hole 22,000-23,400	79 sx slow-set cement, 60 lb. barite per sx, 1.7% Diacel LWL, slurry weight 16 lb./gal.	8,000	Squeezed 60 sx. Spotted 3 sx on top of packer and reversed 16 sx of mixture.
Plug back 22,450-22,572	.....	22,650-22,880	27 sx slow-set cement, 22½% silica flour, 2% Diacel LWL, slurry weight 14.5 lb./gal.	....	Plug back necessary due to retainer failure. Retainer set at 22,572 ft.
Plug back 21,352-21,756	.....	21,690-21,795	50 sx slow-set cement, 22½% silica flour, 2% Diacel LWL, slurry weight 14.5 lb./gal.	....	Unable to break down formation with 10,000 psi. Plug spotted to abandon zone. Reversed 15 sx.
Squeeze	19,776	19,830-19,950	100 sx same as above.	2,600	Squeezed 90 sx. Communication while squeezing. Reversed 10 sx.
Squeeze	19,728	19,830-19,950	Same as above.	9,000	Squeezed 92 sx, reversed 8 sx.
Squeeze	19,556	19,650-19,713	75 sx same as above.	5,800	Squeeeezed 20 sx. Communication established while squeezing. Thirteeen-sack plug put on top of retainer, 42 sx reversed.
Plug back 19,190-18,700	.....	.....	50 sx slow-set cement, 22½% silica flour, 1.5% Diacel LWL, slurry weight 14.8 lb./gal.	....	Reversed 10 sx.
Squeeze	17,806	17,870-18,130	75 sx same as above.	8,300	Squeezed 63 sx, reversed 12 sx.

*All squeeze jobs were performed through drillable retainers or drillable production packers.

TABLE 4—PROPERTIES OF SLOW-SET CEMENT BLENDED WITH SILICA FLOUR AS COMPARED TO BARITE-CEMENT AND NEAT SLURRIES

Diacel LWL (%)	Silica flour (%)	Barite (%)	Density (lb./gal.)	Water loss	—API Schedule 10 and 10S— Thickening time	24-hour compressive strength
2.0	22.5	. .	14.5	2.5	4:45	4,850
2.0	22.5	. .	15.0	2.5	4:29	6,640
2.0	22.5	. .	15.5	1.8	3:02	5,450
2.0	22.5	. .	16.0	1.2	No run	6,150
1.5	. .	63.9	16.0	. .	3:17	840
*1.7	. .	*63.9	*16.0	. .	4:00 plus	775
2.0	. .	63.9	16.0	. .	No run	690
2.0	. .	42.6	14.9	. .	2:35	. .
. .	. .	. .	16.0	. .	Less than 1:00	2,140
1.0	. .	. .	16.0	. .	2:08	. .
2.0	. .	. .	16.0	. .	. .	2,675
2.0	. .	. .	15.0	. .	3:02	. .

*This formulation was used to squeeze a water zone at 23,400 ft. in the 1A Montgomery, Pecos County, Texas.

TABLE 5—CEMENT BLENDS RECOMMENDED FOR SQUEEZE AND PLUG-BACK OPERATIONS IN THE 1-EE UNIVERSITY AND 1A MONTGOMERY

Well depth—	Diacel LWL (%)	SiO_2 (%)	Density (lb./gal.)	Slurry vis.
20,000-TD	2.0	22.5	14.5	Very low
18,000-20,000	1.5	22.5	14.8	Very low
17,000-18,000	1.0	0	15.8	High
16,000-17,000	0.7	0	16.0	Moderately high
15,000-16,000	0.5	0	16.3	Slightly high
10,000-15,000*	0.3	0	16.5	Slightly high
	Diacel A	Diacel LWL		
Surface—10,000*	0.3	0.5	16.0	

*For squeeze only.

The following temperatures were logged at 23,000 ft. in the 1A Montgomery:

16 hours after circulation	364° F.
25 hours after circulation	365° F.

The hole then circulated for 6 hours and further temperature readings obtained:

9 hours after circulation	347° F.
15 hours after circulation	359° F.
19 hours after circulation	362° F.
28 hours after circulation	372° F.

With the selection of 365° F. as an average logged temperature, the bottom-hole circulating temperature was estimated at 344° F. and the static bottom-hole temperature at 380° F.

The original cement recommendation for this job was slow-set cement blended with 16% Diacel D and 2% Diacel LWL slurried to a density of 12.8 lb. per gal. This slurry was to be followed with slow-set cement blended with 0.5% Diacel LWL and slurried to 16.3 lb. per gal. When tested with cement and additions available in the laboratory, both slurries had thickening times of 4 hours or greater at the preceding temperature conditions.

Separate laboratory tests on an actual sample of the cement which was available for this job disclosed that this shipment of cement did not respond to the thickening-time control of Diacel LWL as did the cement originally tested. Further tests showed it would be necessary to increase the Diacel LWL content to 2.5% in the lightweight cement slurry to obtain the desired thickening time. No increase in the Diacel LWL concentration for the neat cement slurry was required.

Long circulation . . . After the casing was landed, mud was circulated for 12 hours before cementing was commenced. This long period of continuous circulation was desirable for two reasons. First, it was necessary to circulate the hole for an extended period of time to effectively remove the gas that had entered the well bore while running casing. This reduced the chances of channeling of the cement and pressure buildup in the annulus following placement of the cement. Failure to remove all the gas-cut mud from the well bore prior to cementing the 5½-in. casing in the 1A Harral is believed to have been a contributing factor in the pressure buildup between strings which occurred following the cement job.

The second reason for the prolonged circulation period was to obtain maximum cooling effect downhole before cementing. Any additional cooling that could be obtained was an added safety factor for the successful placement of the cement.

Again calibrated tanks containing the predetermined volume of mud necessary to displace the cement were used.

After the 12-hour circulating period, the casing was cemented with the recommended cement system consisting of 1,099 sacks of the lightweight cement followed with 150 sacks of the neat cement. A temperature survey located the top of the cement outside the 7-in. casing at 15,839 ft. or 29 ft. in the 9⅝-in. casing. This was just a few feet lower than the calculated cement top prior to the job. If possible, this cement job was an even smoother operation than the similar job on the 1-EE University.

Some secondary jobs . . . Drilling continued to 23,400 ft. Prior to testing the 400-ft. open-hole section, two bottom-hole temperatures were obtained with 500° F. maximum thermometers. These temperatures were 438° F. and 472° F. for an average of 455° F. It is believed that the 472° F. reading is the highest temperature ever recorded in a well.

Testing in the interval yielded water, and it was desired to squeeze cement the open-hole section. The squeeze job was done through a tapered string of 3½ and 2⅞-in. tubing and a permanent production packer set at 22,970 ft. Mud was circulated for 11½ hours at the top of the packer to cool the hole prior to squeezing. The tubing was tested to 10,000 psi. and the surface connections to 13,000 psi.

The open hole was then squeezed with 79 sacks of slow-set cement blended with 60 lb. of barite per sack of cement and 1.7% Diacel LWL by weight of the cement. The total yield was 150 cu. ft. of slurry mixed to 16 lb. per gal. Final squeeze pressure was 8,000 psi. at the surface with 114 cu. ft. of the slurry below the packer.

The seals were pulled from the packer and 6 cu. ft. of slurry displaced on the top of the packer. The remaining slurry volume of 30 cu. ft. was reversed out from 22,940 ft.

The squeeze was accomplished 2 hours from the time cement mixing began, and the job was completed in 3 hours, which included displacing the cement on top of the packer and reversing out the excess cement. The thickening time for this blend was 4 hours at 380° F.

For a primary cement job, the water-to-cement ratio in this 16-lb. per gal. slurry would have been considered excessive. However, on this open-hole squeeze job, any excess water would be squeezed from the slurry resulting in a good cement mixture on bottom. A summary of sub-

SCIENTIST MEETS

ACRAGAGE®

RESULT: PROGRESS!

DEPENDABILITY KEYNOTES THIS TEAM WORKING TO MAKE BETTER PRODUCTS FOR MORE PEOPLE!

The above scientist engaged in research for a leading petroleum producer is typical of thousands in many different industries who rely on Acragage for dependable, accurate instrumentation. This reliance is based on Acragage's reputation for precision workmanship and quality features. The photo shows one of these outstanding features: the full area rear blowout disc. This disc, along with the solid front safety case, assures absolute protection to the viewer: any buildup of internal pressure blows the disc to the rear . . . away from the viewer. Other features include a longer Bourdon Tube, precision movements, and a choice of Tube materials. Write for more information and catalog!

ACRAGAGE GIVES YOU MORE GAGE PER DOLLAR

- VACUUM GAGES
- PRESSURE GAGES
- COMPOUND GAGES
- TEST GAGES
- ELECTRIC TRANSMITTER GAGES
- RECEIVER GAGES
- PNEUMATIC TRANSMITTER GAGES
- CHEMICAL PROTECTORS

INTERNATIONAL REGISTER COMPANY/INSTRUMENT DIVISION

Quality products since 1891

2630 West Washington Blvd., Chicago 12, Illinois

INTERNATIONAL REGISTER COMPANY
INSTRUMENT DIVISION
2630 West Washington Blvd., Chicago 12, Illinois

Gentlemen: Please send me full information on Acragages and a copy of your latest Bulletin No. 59 O

Name_____

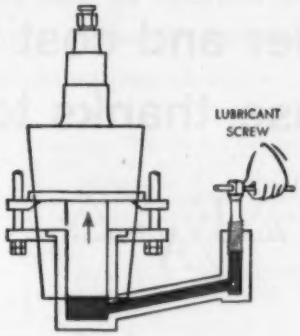
Title_____

Firm_____

Address_____

City_____ Zone____ State_____

The perfect application of a principle



The lubricant system in the Rockwell-Nordstrom valve is a closed hydraulic system acting much like the two pistons shown on the facing page. Instead of having a separate piston to "charge" lubricant into the valve, the screwed lubricant fitting at the top of the plug acts as the first piston. When lubricant is forced through the fitting by a pressure gun or if the lubricant screw is manually turned down, hydraulic force is magnified and forces lubricant through the channels in the plug.

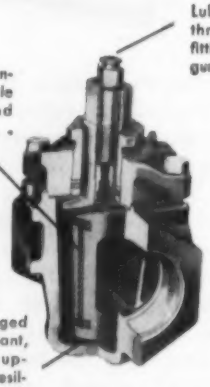
The plug then acts in much the same fashion as the second piston. A shot of lubricant from a pressure gun or a few turns of the lubricant fitting minutely unseats the plug upwards against the resilient shoulder seal, freeing the plug for smooth, easy turning.

(Continued on next page)

(Continued from preceding page)

Here's why Rockwell-Nordstrom valves work better, easier and cost less to use, thanks to

$$\triangle F/A = \triangle p$$


Lubricant injected through Rockwell fitting by pressure gun.
Lubricant through channels in plug forms double pressure seal around each valve port . . . leakage eliminated.
Lubricant chamber, charged with pressurized lubricant, counterbalances plug upwards against slightly resilient shoulder seal. Plug can't be stuck in seat . . . instant, dependable operation.

The drawing above shows how lubricant in Rockwell-Nordstrom valves assures the bottle tight shut-off, smooth, easy operation and unmatched dependability that users have learned to expect over the past forty years. Rockwell-Nordstrom, the *original* lubricated plug valve, is also the world's most complete line. They cost no more to buy, often less, than ordinary valves. Whatever your valve needs, there is a Rockwell field sales engineer, write Rockwell Manufacturing Company, Pittsburgh 8, Pa. Canadian Valve Licensee: Peacock Brothers Limited.

ROCKWELL-Nordstrom VALVES

it's ROCKWELL

MANUFACTURING COMPANY

NEILL

J. P. NEILL AND COMPANY, INC.

PIPE LINE CONSTRUCTION

OIL • GAS • WATER • ENGINEERING

1200 EXCHANGE BANK BUILDING

TELEPHONE FLEETWOOD 7-6621

DALLAS, TEXAS

sequent squeeze jobs and plugbacks on the 1A Montgomery is shown in Table 3.

Additional laboratory information obtained about the time of the open-hole squeeze job on this well showed that a far superior cement could be blended for these deep squeeze jobs by using silica flour instead of or in conjunction with barite. These data are shown in Table 4. Recommendations were then made for the subsequent jobs at various depths in both the 1A Montgomery and the 1-EE University. These recommendations are shown in Table 5.

"With new depth and temperature records being set, it has become apparent that common portland cement will not meet all requirements. . . . In cementing these Pecos County deep wells, only commercially available additives were used. No experimental materials were tried. . . . Oil-well cements must be retarded under deep-well conditions because increased temperature and pressure reduce the thickening time of slurry. . . ."

Discussion

Casing centralizers were used on the bottom portion of each casing string with the exception of conductor or shallow surface strings and those deep strings where restricted hole sizes would not permit their use, such as the 5-in. liner which was run in 5¾-in. hole in the 1-EE University. Centralizers were also spaced above and below each stage collar used. Wall scratchers were not used on the production strings because it was not advisable to attempt rotation or reciprocation at the extreme depths.

Open-hole caliper surveys were available for use in calculating cement-volume requirements on all casing jobs except the surface strings. Occasionally, excess cement was added to the calculated requirement obtained from the caliper survey to assure that the desired fillup would be obtained. Desired fillup was obtained on all but two primary jobs.

On some of the deeper cement jobs where mud had been gas cut, pressure was applied to the annulus at the surface after the cement had been placed. This pressure was left on the annulus until the cement had attained its initial set. This was done in an effort to prevent migration of fluids, particularly gas, from the formation into the well bore while the cement slurry was still in a fluid state. In no case was an amount of pressure applied which would endanger breaking down the formation behind the casing. The effectiveness of this procedure is not definitely conclusive, but may have merit in some instances.

When testing the proposed cement blend for the 5-in. liner in the 1-EE University, it was found that retardation of cements at high temperatures becomes increasingly more difficult as slurry densities are decreased below approximately 13.5 lb. per gal. The cement used on this job was a 20% Diacel D blend slurried to 12.3 lb. per gal. It was necessary to use 3% Diacel LWL by weight of the cement in the slurry to obtain the desired retardation.

On each of the deeper cement jobs where a large volume of cement was used, it was desired to mix and displace the cement at an optimum rate without stopping movement of the slurry at any time until the followup plug was bumped. The cement bins and trucks were located and manifolded in such a manner that the number of pumps mixing or displacing the cement could be varied as required. Depending upon the particular job, one or two standby trucks were connected into the manifolding system as an additional safety precaution. On these more critical jobs, a special plug container was used which permitted releasing the followup plug without stopping the movement of the cement slurry.

References

1. Ludwig, N. C.: "Portland Cements and Their Application in the Oil Industry," Drilling and Production Practice, 183 (1953).
2. API Std. 10A: API Specification for Oil-Well Cements, fifth edition, Jan. 1958.
3. Morgan, B. E.: API Specification for Oil-Well Cements, Paper No. 926-3-J, presented at various district spring meetings, API Division of Production, 1958; The Oil and Gas Journal, Vol. 29, 77, July 21 (1958), also to be published in Drilling and Production Practice (1958) (in press).
4. The Oil and Gas Journal: "A New Record—15,868 Ft. of 9⅝-In. Casing," Vol. 56, No. 17, 91, April 28 (1958).
5. MacDonald, G. C.: "What Causes Primary Cement Failures," World Oil, Vol. 143, No. 2, 115, Aug. 1 (1956).
6. Webber, J. C.: Report on Gel Cementing (presented on behalf of the Southwestern District Study Committee on Primary Cementing.
7. Morgan, B. E., and Dumbauld, G. K.: "Recent Developments in the Use of Bentonite in Cement," Drilling and Production Practice, 163 (1953).
8. Smith, D. K.: "Physical Properties of Gel Cements," Petroleum Engineer, Vol. 23, No. 4, B-7, April (1951).
9. Nussbaumer, F. W., and Saunders, C. D.: "Trends in Use of Low-Weight Cement Slurries," Drilling and Production Practice, 189 (1952).
10. Saunders, C. D., and Brown, B. D.: "A New Material for Cementing Wells," Petroleum Engineer, Vol. 24, No. 11, B-80, Oct. (1952).
11. Stern, W. P.: "Pozzolans for Oil-Well Cementing," The Oil and Gas Journal, Vol. 51, No. 9, 72, July 7 (1952).
12. Bergman, W. E.: Hurley, J. R.; and Shell, F. J.: "New Oil-Well Cement Blend," World Oil (in 2 parts): Part 1, Vol. 141, 99, Sept. (1955); Part II, Vol. 141, 150, Nov. (1955).
13. Porter, E. W.: "Cement Additives Cut Cement Costs," World Oil, Vol. 146, No. 2, 63, Feb. 1 (1958).
14. Shell, F. J.; Hurley, J. R.; Bergman, W. E.; and Fisher, H. B.: "Low-Density Oil-Well Cements," World Oil, Vol. 143, No. 4, 131, Sept. (1956).
15. Shell, F. J.: "DE—An Aid to Cementing Casing Through Salt Zones," Petroleum Engineer, Vol. 29, No. 3, B-100, March (1957).
16. Shell, F. J., and Wynne, R. A.: "Application of Low-Water-Loss Cement Slurries," API Paper No. 875-12-1, presented at the spring meeting of the Rocky Mountain District, Division of Production, April 21-23, 1958.
17. Zimmerman, R. M.; Terrell, T. H.; and Nagle, E. T., Jr.: "The Drilling and Completion of the Richardson & Bass-Mecom-Freeport-Humble-LL&E-State 2414, Well No. 1L, Drilling and Production Practice, 14 (1957).
18. Bleakley, W. B.: "Shell's 5 Rumberger Bottomed at 24,002 Ft. to Become World's Second-Deepest Well," The Oil and Gas Journal, Vol. 56, No. 49, 77, Dec. 8 (1958).
19. Swayze, M. A.: "Effects of High Temperatures and Pressures on Strengths of Oil-Well Cements," presented on behalf of the Mid-Continent District Study Committee on Cementing Practices, Drilling and Production Practice, 72 (1954).
20. Ludwig, N. C., and Pence, S. A.: "Properties of Portland Cement Pastes Cured at Elevated Temperatures and Pressures," Journal of the American Concrete Institute, Vol. 27, 673 (1956).
21. Dunlap, I. R., and Patchen, F. D.: "A High-Temperature Oil-Well Cement," Petroleum Engineer, Vol. 29, No. 12, B-60, Nov. (1957).
22. Howard, G. C., and Clark, J. B.: "Factors to Be Considered in Obtaining Proper Cementing of Casing," The Oil and Gas Journal, Vol. 147, No. 28, 243, Nov. 11 (1948), Drilling and Production Practice, 257 (1948).
23. Huber, T. A., and Tausch, G. A.: "Permanent-Type Well Completions," The Oil and Gas Journal, Vol. 53, No. 49, 103, April 11 (1955).
24. Broussard, P. J., and McNatt, J. C.: "An Improved High-Pressure Squeeze Cementing Technique," Drilling, Vol. 19, No. 9, 100, July (1958).
25. API RP 10B: API Recommended Practice for Testing Oil-Well Cements, seventh edition, Jan. (1958).
26. The Oil and Gas Journal: "Casing the World's Deepest Well," Vol. 56, No. 25, 77, June 23 (1958).

Monthly Report on PIPELINE CONSTRUCTION

PIPELINE ACTIVITY reported here is compiled from surveys by The Oil and Gas Journal among pipeline companies and construction contractors.

This summary report appears in the last issue of the Journal each month. New construction projects are reported weekly in Pipeline Briefs in the Journal's news section.

Projects are listed in three groups —U. S., Canadian, and Foreign— and according to type of line—crude, products, or natural gas.

U. S. Crude Oil Pipelines

• **Cameron Crude Oil Corp.,** Tulsa.
Project: 45 miles of 6 and 8-in. trunk line and 16 miles of gathering line from Laverne, Okla., to Jayhawk Pipe Line, Harper Ranch station, Clark County, Kans.
Status: Under way.
Contractor: **Monarch Constructors, Inc.,** Medicine Lodge, Kans.
Completion: Summer 1959.

• **Cape Pipe Line Co.** (Sun Oil Co., Cities Service Co., Atlantic Refining Co.), Philadelphia.
Project: Line from lower Delaware Bay to Philadelphia.
Status: Planned.
Completion: 1960.

• **Gillette Pipeline, Inc.,** and **A. W. Hartwig, Inc.**
Project: A 102-mile line from Dead Horse Creek field to Casper, Wyo.
Status: Pending Wyoming Public Service Commission approval.

• **Great Northern Railway Co.**
Project: 400 to 600 miles of 12 to 20-in. from Williston basin in Mont. and N. D., to Clearbrook or St. Paul, Minn.
Contractor: **Pipe Line Technologists, Inc.,** Houston, has completed feasibility study.

• **Husky Oil Co.,** Cody, Wyo.
Project: Gathering lines to the refinery at Cody.
Status: Planned.

• **International Oil Pipeline Corp.,** New York City.
Project: Would own U. S. section of 1,500-mile, 30-in. line proposed by Mid-Continent Pipe Lines, Ltd., from Edmonton, Alta., to Chicago. (See Canadian Crude-Oil Pipelines).
Status: Proposed.

• **Mid-Continent Pipe Line Co.,** Tulsa.
Project: Lines in Okla.: 3 miles of 10-in. from Duncan to Velma; 6 miles of 8-in. from Cromwell to Tiger Creek Junction; 5 miles of 6-in. from Key West to Beggs, 12 miles of 8-in. from Drumright to Tulsa; 7 miles of 4-in. from Key West to Davenport.
Status: Planned.
Completion: 1959.

• **Service Pipe Line Co.,** Tulsa, Okla.
Project: 9 miles of 10-in. from Snyder to Colorado City, Tex.
Status: Planned.
Completion: November 1959.

• **Teton Pipeline Co.,** Denver.
Project: 8 miles of 5-in. to connect O'Brien field, Carbon Co., Wyo., with the Sinclair Pipe Line system.
Status: Planned.

• **Wilcox Crude Oil Corp.,** Shreveport, La.
Project: 20-mile small-diameter line from Harrisonburg and Ross Bayou, La.
Status: Under way.
Completion: May 1959.

U. S. Products Pipelines

• **Buckeye Pipe Line Co., N. Y. C.**
Project: 101 miles of 8-in. from Wayne, Mich., to Flint and Owosso, Mich.
Status: Under way.
Project: 19.5 miles of 8-in. from Wayne to Trenton, Mich.
Status: Under way.
Contractor: **R. L. Coolsaet Construction Co.,** Dearborn, Mich.
Completion: Fall 1959.

• **El Paso Natural Gas Co.,** El Paso, Tex.
Project: 97 miles of 6-in. LPG line from Aneth to Chaco products line.
Status: Planned.
Contractor: **R. H. Fulton.**
Completion: June 1959.

• **Florida Pipeline & Storage Co.,** Uniontown, Pa.
Project: 54 miles of 6-in. from Fort Everglades to Homestead Air Force Base, Fla.
Status: Planned.

• **Husky Oil Co.,** Cody, Wyo.
Project: Line from Cody to the Yellowstone products line west from Billings, Mont.
Status: Planned.

• **Katy and New York Central Railroads.**
Project: 2,500 miles of 10-in. and smaller LPG line from Houston through Kansas City, St. Louis, Indianapolis, and Cleveland to Syracuse, then down to New York City. A branch would go through Chicago to Detroit.
Status: Proposed.
Contractor: **Williams Brothers Co.,** Tulsa, has completed feasibility study.

• **Okan Pipeline Co.,** Tulsa.
Project: 28 miles of 4-in. from Mocane, Okla., plant to Liberal, Kans., station.
Status: To start in June.
Completion: Summer 1959.

• **Plantation Pipe Line Co.,** Atlanta.
Project: Take up, recondition, coat and wrap, and re-lay 46 miles of 4-in., 38 miles of 10-in., and 7 miles of 12-in. in Georgia.
Status: Under way.
Contractor: **Latex Construction Co. of Georgia,** Atlanta.
Completion: June 15, 1959.
Project: A 10-mile, 12-in. line from Mont Belvieu terminal to Baytown, Tex.
Status: Planned.
Completion: Summer 1959.

U. S. Natural Gas Pipelines

• **Algonquin Gas Transmission Co.,** Boston.
Project: 6 miles of 20-in. from Mendon to Wrantham, Mass., and 3 miles of 8-in. at Freeton, Mass.
Status: Pending FPC approval.
Completion: July 31, 1959.

• **Arkansas Industrial Pipeline Corp. (Arkansas Louisiana Gas Co.), Shreveport, La.**
Project: 130 miles of 18-in. from Perla to Helena, Ark.
Status: Planned.
Completion: 1959.

• **Arkansas Louisiana Gas Co., Shreveport, La.**
Project: 98 miles of 16-in. from Aetna field, Ark., to Jones Mill, Ark.
Status: Under way.
Contractor: Company crews.
Completion: July 1, 1959.
Project: 3 miles of 2-in., 58.5 miles of 4-in., and 2 miles of 6-in. gathering line.
Status: Planned in 1959.
Project: 77.4 miles of 6-in. transmission lines.
Status: Planned in 1959.

• **Atlantic Seaboard Corp.,** Charleston, W. Va.
Project: 19.8 miles of 26-in. and 6.4 miles of 20-in. loop in W. Va.
Status: Pending FPC approval.
Completion: Fall 1959.
Project: 43.4 miles of 26-in. in W. Va.
Status: Under way.
Contractor: **Williams Brothers Co.,** Tulsa.
Completion: Summer 1959.

• **Central Hudson Gas & Electric Corp.,** Poughkeepsie, N. Y.
Project: 13 miles of 10-in. from Highland to Kingston (Part II), N. Y.
Status: Planned.
Completion: 1960.

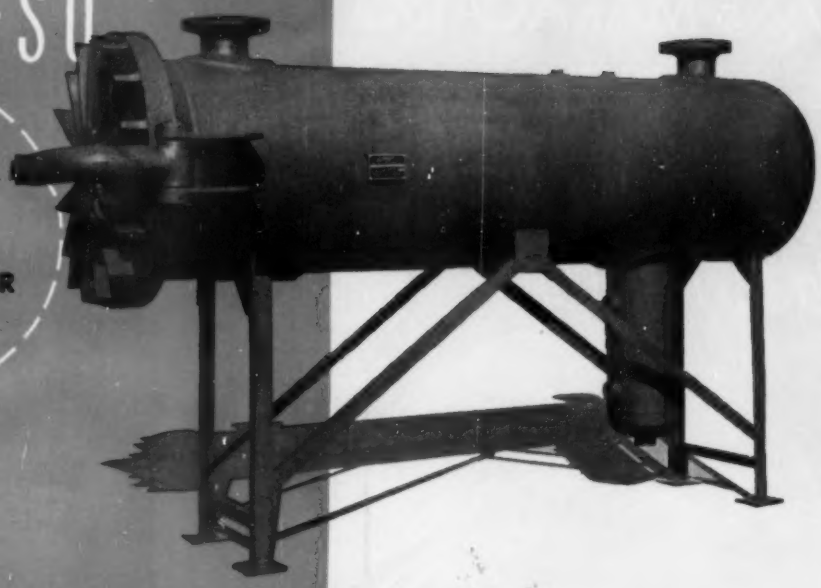
• **Chicago District Pipeline Co.**
Project: 50 miles of 36-in. from Joliet to Chicago.
Status: Pending FPC approval.
Completion: Fall 1959.

• **Cities Service Gas Co.,** Oklahoma City.
Project: 21.5 miles of 30-in. loop between Welda and Franklin County, Kans.; 4.2 miles of 16-in. on Saginaw-Springfield, Mo., system; 7.2 miles of 16-in. near Fort Scott, Kans.; and 4.6 miles of 16-in. west of Lawrence, Kans.
Status: Pending FPCapproval.

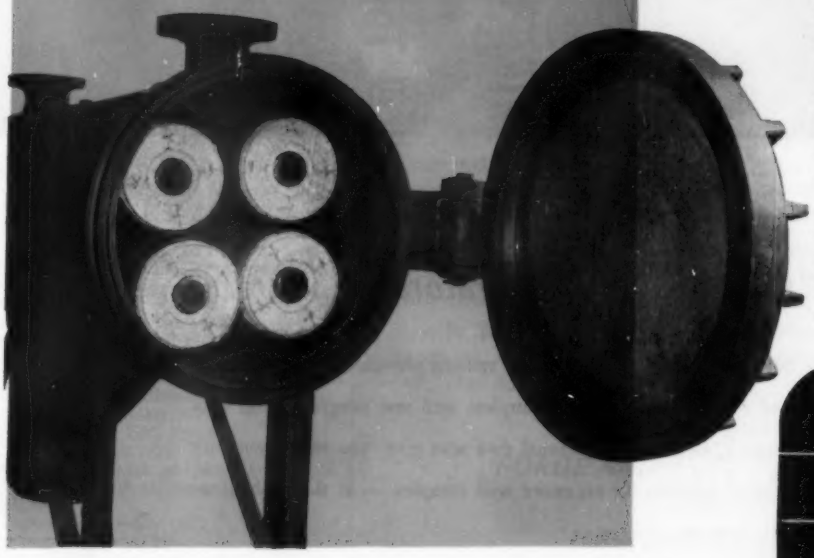
• **Coastal Transmission Corp.,** Houston
Project: 147 miles of 20-in. from Robstown to Bay City, Tex.; 68 miles of 22-in. from Bay City to Galveston Bay, Tex.; 252 miles of 24-in. from Galveston Bay to Baton Rouge, La.
Status: Under way.
Contractor: **Oklahoma Contracting Co.,** Dallas, has 130 miles of 24-in. from Baton Rouge to Lake Charles, La., Leamon Creech, supt., office at Port Barre, La., and 147 miles of 20-in. from Robstown to Bay City, Tex., Ed Peters, supt., office at Robstown. **Brown & Root, Inc.,** Houston, has 11 miles of 24-in. across Galveston Bay. **River Construction Co.,** Fort Worth, has 105 miles of 24-in. from Galveston Bay to north of Lake Charles, La., to complete May 1, 1959, T. M. Tatom, spread supt. **Buddy Sherrod, Inc.,** Conroe, Tex., has the Natchez River crossing between Beaumont and Port Arthur, Tex. **Panama-Williams,**

EXCEL-SO

HP-700
CLUSTER
REPACK
SEPARATOR
STRAINER



. . . the only high volume pipeline strainer that removes free water from petroleum products!



The HP-700 is rated from 750 to 1000 GPM on gasoline and fuel oil. The four repack cartridges provide a total filtering area of approximately 5,500 square inches. This Separator-Filter effectively removes solid particles down to forty microns in size. Equipped with quick opening closures and other easy service features, this compact unit is designed especially for the pipeline industry. Write for detailed information.

WARNER LEWIS COMPANY

BOX 3096 • TULSA, OKLAHOMA

DIVISION OF **FRAM** CORPORATION

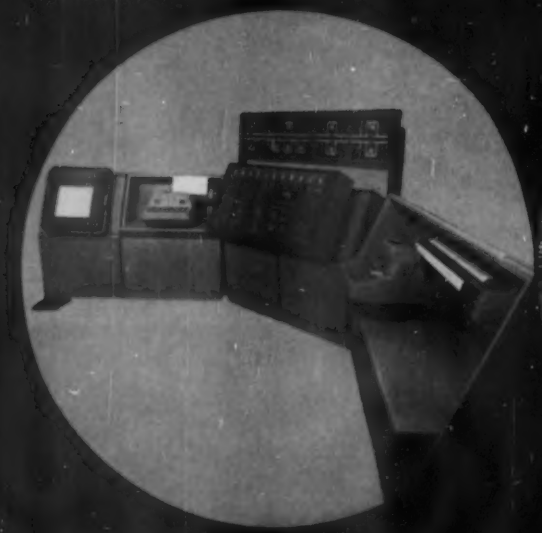
An OFFSHORE first

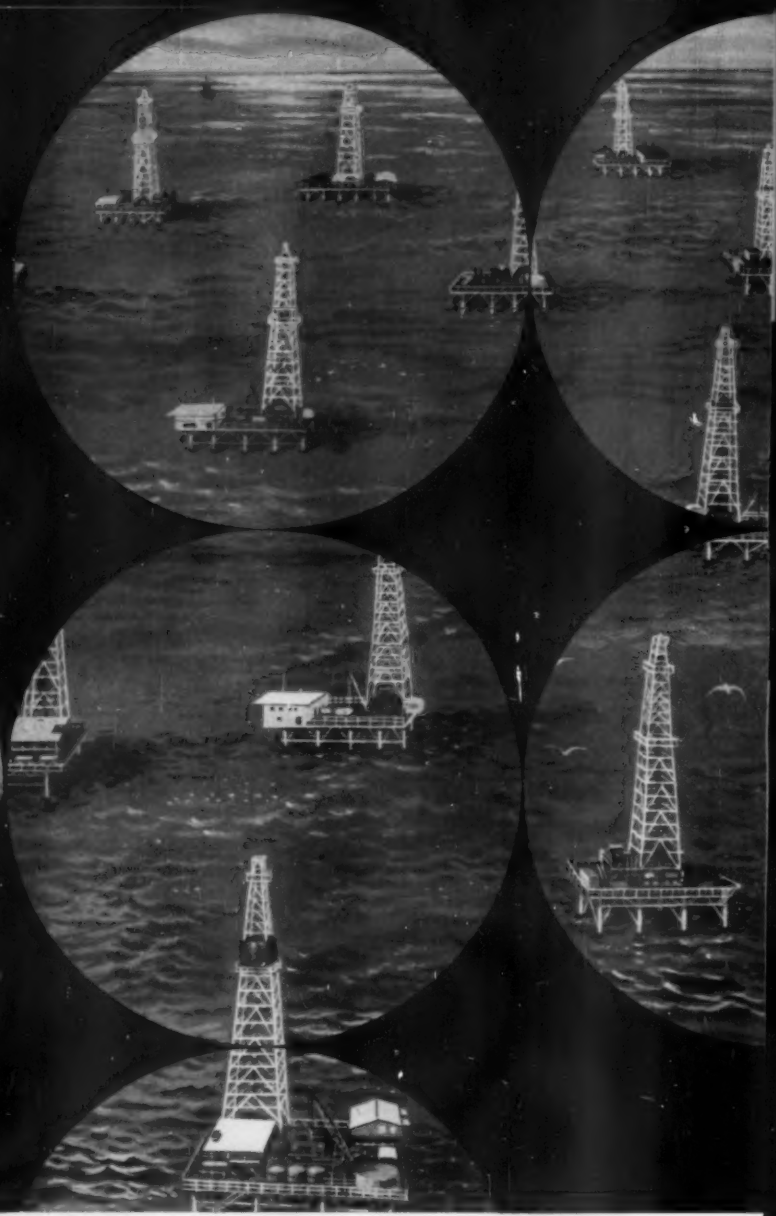
from SIE *and Dresser!*

LAKE MARACAIBO

wells under

PUSH BUTTON CONTROL





Eliminates ALL operators on platform

SIE solid state electronic control systems provide remote well head and flow station control. Complete well test programming, data logging, alarms and continual data scan give you *every* necessary control function for an *entire* well complex — at the push of an SIE button!

Write Rex Grey for your personal copy of . . .

"Control . . . the answer to increased pipe line profits"

Only specialists in control devoted to the Oil Industry

SOUTHWESTERN INDUSTRIAL ELECTRONICS CO.

A DIVISION OF DRESSER INDUSTRIES, INC.

10201 Westheimer • P. O. Box 13058 • Houston 19, Texas

CABLE ADDRESS: SIECO HOUSTON

SIE

PIPELINE CONSTRUCTION

Houston, has 63 miles of 22-in. between Bay City, Tex., and Galveston Bay.
Completion: May 1, 1959.
Project: 320 miles of 3 to 14-in. gathering lines at various locations on Tex. and La. Gulf Coast.
Contractor: **Barry Construction Co.**, Pearland, Tex., has 63 miles of 3 to 8-in.
Completion: April 1959.

- **Colorado Interstate Gas Co.**, Colorado Springs, Colo.

Project: 109 miles of 26-in. from Four-Way station in Tex. Panhandle, to Morton Junction in southeastern Colo.; 135 miles of 34-in. from there to Pueblo, and 100 miles of 30-in. on to Denver; 148 miles of 34-in. from CIG line at Rock Springs, Wyo., to Provo, Utah, to connect with proposed El Paso Natural Gas Co.'s line to Calif.
Status: Planned.
Completion: January 1, 1960.

- **Colorado Oil & Gas Corp.**, Denver.

Project: 402-mile line from Gubik field to Fairbanks, Alaska.
Status: Proposed.

- **Columbia Gulf Transmission Co.**, Houston.

Project: 11 miles supply line connecting Block 17 field, East Cameron area, La.
Status: Approved.
Project: 10 miles of 12-in. supply loop to Erath field, Vermilion Parish, La., and 9 miles of various-size field lines in Acadia and Vermilion parishes, La.
Status: Approved.
Project: 10 miles of 20-in. loop in Jefferson Davis and Vermilion parishes, La., and 3 miles of 6-in. loop in Cameron Parish, La.
Status: Approved.

- **Commonwealth Natural Gas Corp.**, Richmond, Va.

Project: 17.6 miles of 12-in. from Wakefield to Windsor, Va.
Contractor: **Latex Construction of Georgia**, Atlanta.
Completion: Sept. 1, 1959.

- **Consumers Power Co.**, Jackson, Mich.

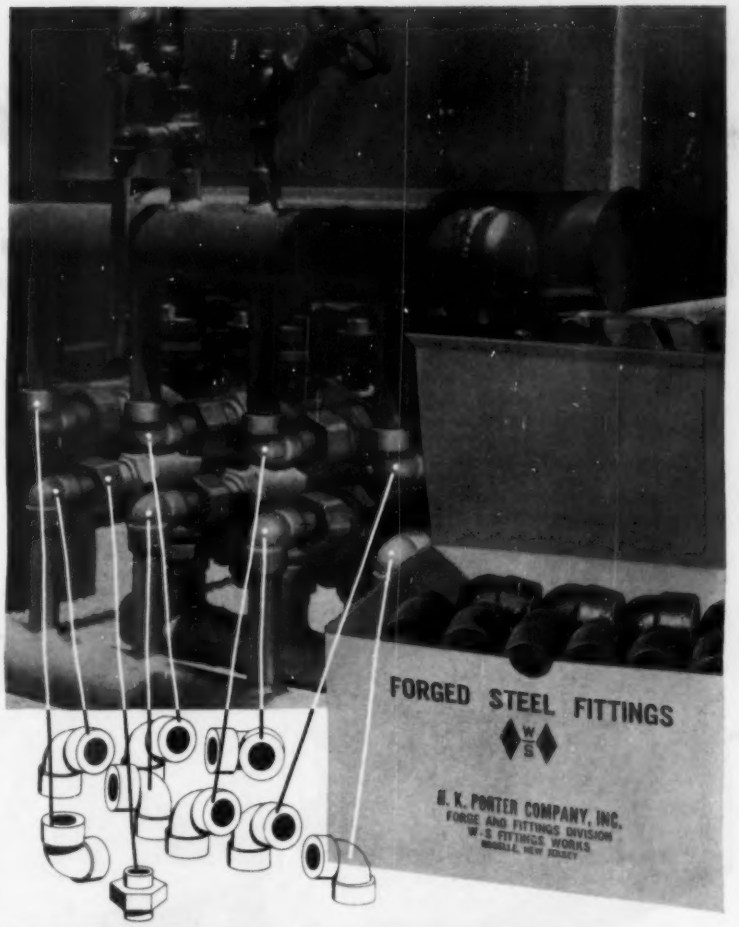
Project: 40 miles of 24-in. from Woodbury station to Laingsburg Junction, Mich.
Status: Under way.
Contractor: **Williams Brothers Co.**, Tulsa.
Completion: July 15, 1959.
Project: 120 miles of 26-in. from Mich.-Ind. border connection with Trunkline Gas Co., to Plymouth, Mich., and 20 miles of 24-in. from Northville to Clarkston, Mich.
Status: Planned.
Completion: Nov. 15, 1959.

- **El Paso Natural Gas Co.**, El Paso, Tex.

Project: 51 miles of 20-in. from Terrell to Puckett, Tex., and 34 miles of 20-in. from Puckett tie-in to Goldsmith, Tex.
Status: Planned.
Completion: January 1960.
Project: 244 miles of 30-in. Permian-San Juan Line loops.
Status: Planned.
Completion: November 1959.
Project: 87 miles of gathering lines in Bisti field in San Juan Co., N. M.
Status: Has temporary FPC approval.
Project: 62-mile gathering system of 4½-10-in. in Beaver County, Okla.
Status: Pending FPC approval.
Completion: Fall 1959.
Project: 400 miles of 34-in. from Salt Lake City, to Calif. border near Las Vegas, Nev.
Completion: January 1960.

- **Equitable Gas Co.**, Pittsburgh.

Project: 12.5 miles of 16-in. in W. Va.
Status: Pending FPC approval.
Completion: Fall 1959.
Project: 15.3 miles of 16-in., 3 miles of 20-in. in W. Va. and Pa.
Status: Planned.



FORGED for long life
PACKAGED for convenience

The "Forged" in W-S Forged Fittings means dependability under the toughest piping-job conditions. "Forged" gives you the added resistance to pressure, heat, corrosion, shock and vibration needed to make your installations long-lived and safe. And W-S Fittings are easily installed, with tight fits and perfect alignment . . . thanks to W-S precision machining methods and quality forging techniques.

Packaging, too, is a W-S brand advantage. Virtually any "mix" of fitting types and sizes can be packed in a convenient W-S Case or Half-case . . . each type and size in its own carton.

Specify W-S on your next order. For specifications and Distributor locations, write *Forge and Fittings Division, H. K. Porter Company, Inc., Box 95, Roselle, New Jersey.*

FORGE AND PORTER FITTINGS DIVISION

H.K. PORTER COMPANY, INC.

PORTER SERVES INDUSTRY: with Rubber and Friction Products—THERMOID DIVISION; Electrical Equipment—DELTA-STAR ELECTRIC DIVISION, NATIONAL ELECTRIC DIVISION; Copper and Alloys—RIVERSIDE-ALLOY METAL DIVISION; Refractories—REFRACTORIES DIVISION; Electric Furnace Steel—CONNORS STEEL DIVISION, VULCAN-KIDD STEEL DIVISION; Fabricated Products—DISSTON DIVISION, FORGE AND FITTINGS DIVISION, LESCHEN WIRE ROPE DIVISION, MOULDINGS DIVISION; and in Canada, Refractories, "Disston" Tools, "Federal" Wires and Cables, "Nepcoduct" Systems—H. K. PORTER COMPANY (CANADA) LTD.

NOW... 3 new pipeline with International® TD-15

New hydraulic counterweight International Superior SBI-150-BH sideboom with 46,500 lb. lift at 4'. Carried and powered by the new 105-hp 6-cylinder TD-15 crawler. Outfit shown is equipped with hydraulic blade backfiller which can be ordered as an attachment; considerably increasing the utility value of the unit.

NEW BIG-LIFT SBI-150-BH SIDEBOOM

..."RIDES" A TRUCK without "PAPERS"

Biggest lifter in its hp class the new International Superior SBI-150-BH sideboom is powered and platformed by the load-speeding new 6-cylinder TD-15 tractor! This hydraulic counterweight machine can pick up 46,500 lbs. of pipe (at 4') and "go to town." And you can truck-haul this compact big-pipe handler without highway permits in most states.

On the job, this 105-hp rig gives you 6-roller, rigid-track traction, with 98⅜ inches of track-on-ground length! High-clearance hinge points on the sideboom provide maximum clearance in soft footing. Underside design is clean—with engine and transmission guards completely enclosed. Levers are stacked for operating ease and safety. Single drum on each shaft provides wear-saving cable alignment. Drums are gear-driven for long life and quiet operation!

Try this standout performer on your job!

NEW SBI-150 SIDEBOOM

spread-speeders

6-cyl. power and mobility!

NEW INTERNATIONAL 150-W WELDER

...the only factory designed tractor-powered-and-mounted welding unit!

Above, new 325 amp International 150-W Welder. Note conveniently-placed welding unit controls at operator's right. Inset (right) shows the free drawbar for pulling supply sled or other loads—or to mount a winch for emergency "cabling." Outfit weighs 29,010 lbs.

Here's the new compact, high output International 150-W Welder—ideally sized, mounted, and controlled for the cross-country tack-welding, or hot-pass-welding crew!

Teamed with the new 6-cylinder TD-15 crawler equipped to produce 128 int. hp, this 325 amp unit consists of two Lincoln dual welders—with four welding leads. Control panels are within easy reach at operator's right. Unit is completely sealed against dirt and moisture. Front pto driven, by V-belt (standard), or chain drive (optional).

This self-contained, self-propelled unit is designed to maintain correct tractor balance on all terrain. Accommodates maximum width track shoes for maximum flotation in swampy right-of-way. Engine hp balances load requirements for top performance and economy.

See this heavy-duty welder—the only unit completely factory designed and mounted, for reliability and long life!

.....with maximum flotation and balance!

Wherever maximum flotation and balance are preferable over the maximum-lift of the hydraulic-counterweighted model, the new SBI-150 static-counterweighted sideboom moves in.

This International Superior unit lifts 34,580 lbs. at 4'.* It provides reserve tractor-sideboom balance and flotation to beat adverse weather in tough terrain.

In this 105-hp outfit you get individual gear-driven drum shafts for long life; quiet operation. Vertically-stacked horizontal control levers, for operating ease and safety; quick-change counterweights. Plus the other famous International Superior features that increase capacity, reduce cost!

**With backfiller blade attachment unit lifts 36,310 lbs. at 4'.*

See your International Superior Distributor—and find out what these new 6-cylinder TD-15 powered and mounted machines can do for you. Compare the advantages of the TD-15's 6-speed, full-reverse transmission, Shuttle-Bar forward-reverse control, dry-type sintered metal faced engine clutch, to anything else on tracks! Ask for a demonstration!

International Harvester Company, Chicago 1, Illinois

INTERNATIONAL®

SUPERIOR

WHEELING
COUPLINGS
FOR OIL COUNTRY USE

LINE PIPE COUPLINGS A.P.I.
⅛" to 12"—Seamless
Black or Galvanized
PLAIN TUBING COUPLINGS A.P.I.
1" to 4"—Seamless
EXTERNAL UPSET TUBING COUPLINGS A.P.I.
¾" to 3½"—Seamless
CASING COUPLINGS A.P.I.
½" to 13⅜"—Long or Short
HYDRAULIC COUPLINGS
⅛" to 4"—Seamless
REAMED AND DRIFTED A.I.S.I.
¾" to 12"—Seamless
DRIVE PIPE COUPLINGS
6" to 12"—Seamless
PIPE NIPPLES—All Sizes and Types
STEEL BUSHINGS AND PLUGS
Merchant and High Pressure

WHEELING MACHINE
PRODUCTS COMPANY
WHEELING, WEST VIRGINIA
WEST COAST FACTORY: WOODLAKE, CALIFORNIA

DESIGNED, TESTED AND PROVEN
IN THE OIL FIELDS

Screened
Air Port

Unexcelled . . .
for Outdoor Use

- DRIP PROOF
- VERMIN PROOF
- MOISTURE PROOF
- CORROSION RESISTANT
- FORCED AIR COOLED

All these features of Fieldmaster Ball Bearing Motors have been designed to overcome the rugged conditions of Oil Field requirements.

CHECK THESE
OUTSTANDING ADVANTAGES.

Heavy Cast base for alignment, stability, heavy duty, double-shielded, prelubricated bearings, reduces lubrication worries, high grade silicon steel in the magnetic circuit reduces iron losses . . . Wide variety of windings provides triple ratings, dual voltages . . . high torque licks heavy starting problems. High slip is available to take care of reciprocating load requirements encountered in pumping.

FIELDMASTER

Write For Descriptive Literature.

BETHLEHEM STEEL CO. TULSA, OKLAHOMA
SUPPLY DIVISION

Manufactured by VALLEY ELECTRIC CORPORATION, St. Louis 8, Mo.

PIPELINE CONSTRUCTION

Completion: Fall 1960.
Project: 14.7 miles of 16-in., 5.9 miles of 20-in. in Pa.
Status: Planned.
Completion: Fall 1961.
Project: 17.25 miles of 20-in. in Pa.
Status: Planned.
Completion: Fall 1962.

- **Gulf Resources, Inc.,** New York.

Project: 136 miles of 14 and 20-in. from Hidalgo County to LaSalle County, Texas.
Status: Pending FPC approval.

- **Hope Natural Gas Co.,** Clarksburg, W. Va.

Project: 20 miles of 24-in. line in Wetzel and Monongalia counties, W. Va., replacing two 16-in. lines.
Status: Approved.
Project: 45-mile line from W. Va. to Pittsburgh area.
Status: Planned.
Completion: Fall 1959.

- **Houston Texas Gas & Oil Corp.,** St. Petersburg, Fla.

Project: 679 miles of 24-in. from Baton Rouge, La., to Kissimmee, Fla.; 138 miles of 18-in. and 97 miles of 20-in. from Kissimmee to Cutler, Fla.; 702 miles of 3 through 18-in. sales laterals in Fla. Main line will join Coastal Transmission's line from McAllen, Tex., to Baton Rouge, La.
Status: Under way.
Contractor: **Midwestern-Walco Contractors,** St. Petersburg, Fla., has the 24-in. with spread offices at Denham Springs, La., Lacedale, Miss., and Vernon, Fla. **Harbert Construction Corp.,** Birmingham, has remainder, of which 150 miles of 3 to 16-in. Fla. laterals have been subcontracted to **Mid-States Construction Corp.,** Mt. Vernon, Ill.
Completion: June 1959.

- **Humble Oil & Refining Co.,** Houston.

Project: 238 miles of 30-in. from King Ranch plant to Clear Lake plant near Houston.
Status: Under way.
Contractor: **Panama, Inc.,** Houston.
Completion: July 1959.

- **Iron Ranges Natural Gas Co.,** St. Paul.

Project: 79 miles of 10 and 12-in. from Grand Rapids to Hoyt Lake, Minn., and 67 miles of 12-in. from Duluth to Silver Bay, Minn.
Status: Pending FPC approval.
Completion: Fall 1959.

- **Iroquois Gas Co.**

Project: 9.5 miles of 16-in. in Erie County, N. Y.
Status: Pending FPC approval.

- **Kansas-Nebraska Natural Gas Co., Inc.,** Phillipsburg, Kans.

Project: 15.5 miles of 12-in. loop in western Kansas.
Status: Pending FPC approval.
Completion: Fall 1959.

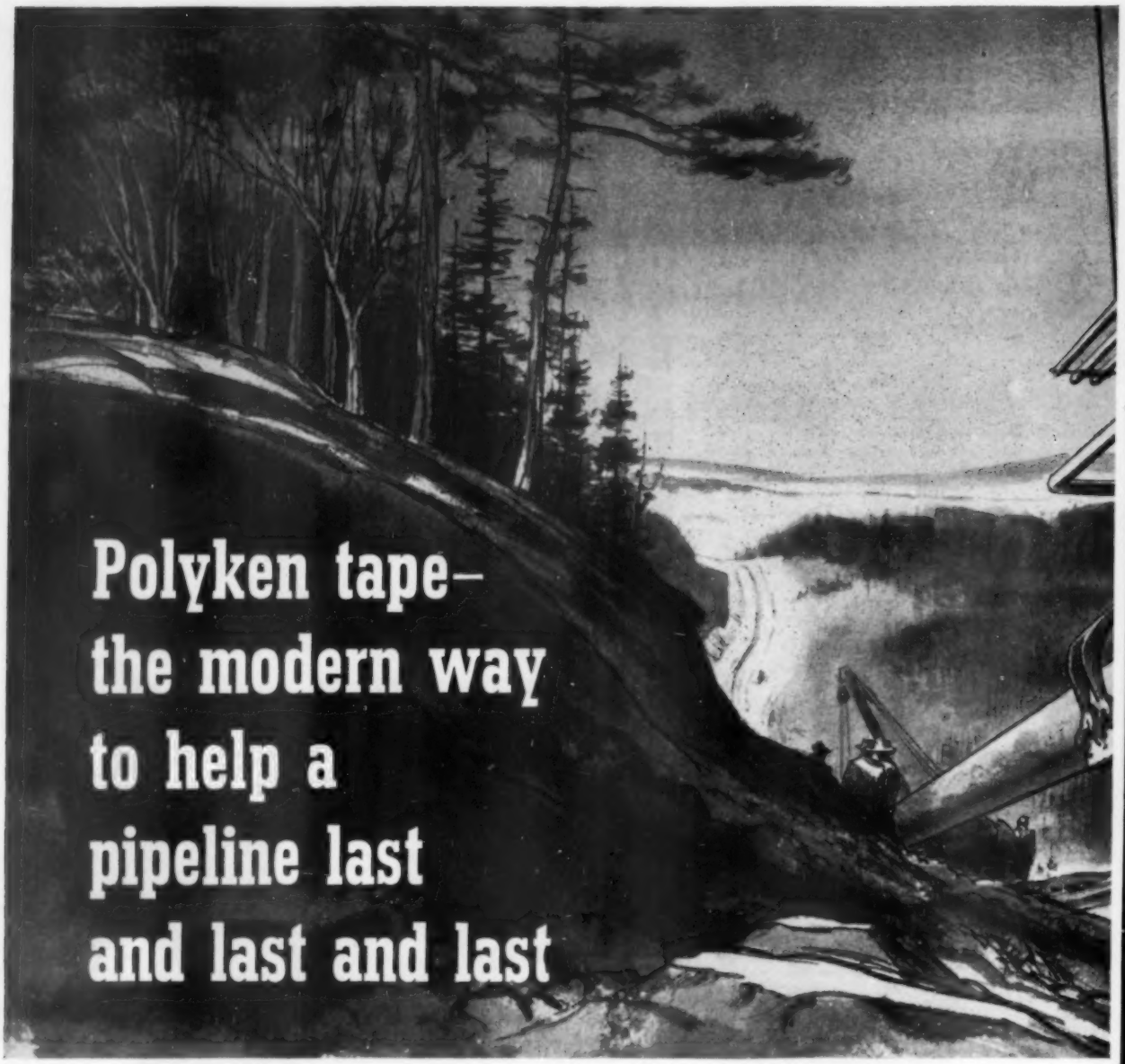
- **Lone Star Gas Co.,** Dallas.

Project: 12.4 miles of 20-in. from Parker County to Fort Worth, Tex.
Status: Under way.
Contractor: Company crews.
Completion: June 1, 1959.
Project: 36 miles of 20-in. from Navarro County to Dallas, Tex.
Status: Under way.
Contractor: Company crews.
Completion: Aug. 1, 1959.
Project: 4.7 miles of 24-in. from Dallas County.
Status: Planned.
Contractor: Company crews.
Completion: Sept. 1, 1959.

- **Louisville Gas & Electric Co.,** Louisville, Ky.

Project: 20 miles of 20-in. between Muldraugh and Louisville, Ky.
Status: Under way.
Contractor: **Williams Brothers Co.,** Tulsa.

Think you've got a lasting "hide"?
Wait till you see what
they've got on the next page!



Polyken polyethylene tape, noted for its construction economies, now proves its dependability on the big jobs.

There's good reason why more and more pipeline is coated this way today—the modern way—with Polyken tape.

The reason is *performance.*

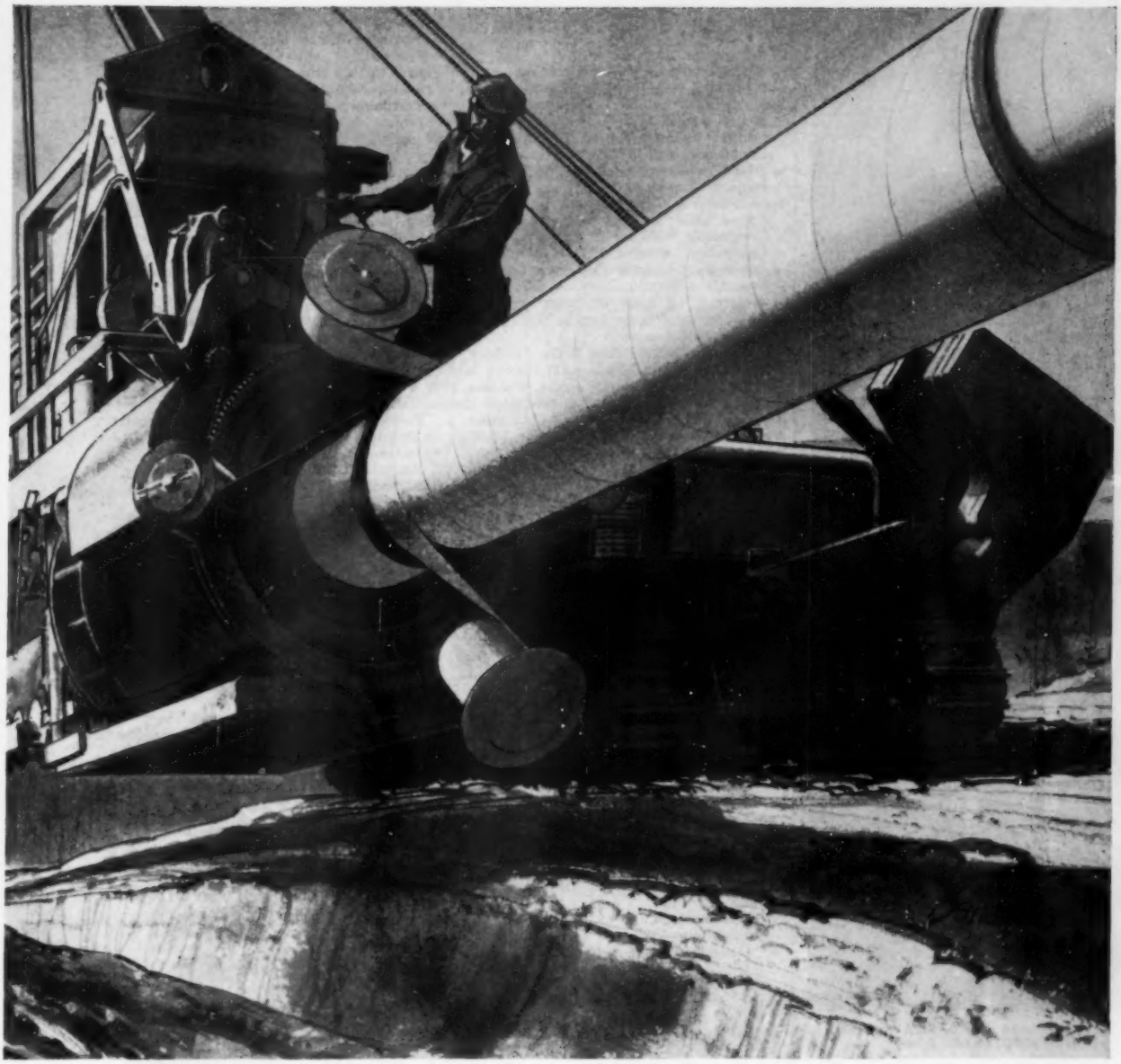
Take the experience of the Houston Texas Gas and Oil Corporation—the largest single pipeline coating order in history.

First, they had their engineering staff give Polyken intensive corrosion-resistance and performance tests. They checked the experience of other users. They studied tape construction practices as an important source of applied quality control. They analyzed tape coating spreads and saw the actual difference in unit operations and costs between the Polyken method and the ordinary enamel method.

Polyken passed with flying colors.

Then they added up the dollars and discovered that a Polyken-wrap job would save them better than half a million dollars, compared with the conventional "hot dope" coating.

Advantages like these can be yours. To get the full story on how Polyken can do a better job for



you—and save you money—call your Polyken Representative, or write Polyken Sales Division, 309 W. Jackson Blvd., Chicago 6, Illinois.

Polyken®

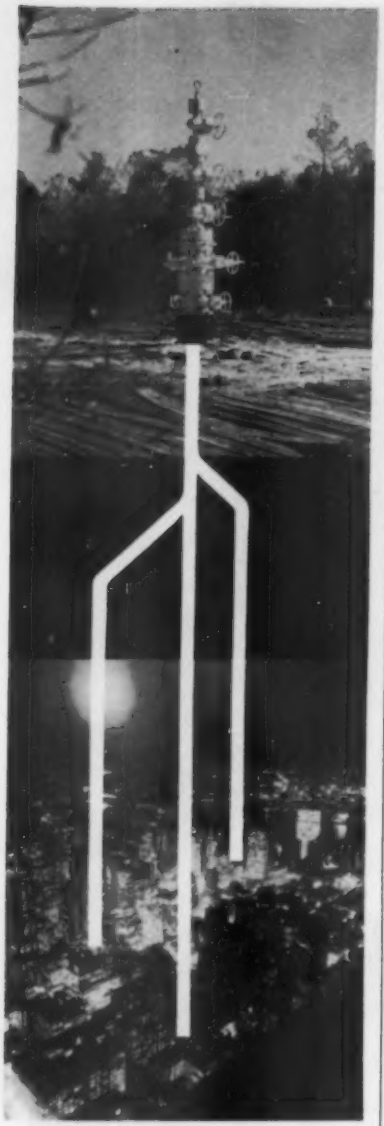
EXPERIENCED IN PROTECTIVE COATINGS

THE KENDALL COMPANY

Polyken Sales Division

↑ Pipeline is simultaneously cleaned and wrapped. Polyken Tape (dark spools) goes on without a primer, in factory-uniform condition... then is overwrapped (gray spools).

← The Houston line gets Polyken-wrapped pipe into the ditch immediately after coating. Fieldmen say this method makes for a tight, clean, fast spread.



Carrying Texas and Louisiana natural gas to the markets where the most people are

TRANSCONTINENTAL GAS PIPE LINE CORPORATION

PIPELINE CONSTRUCTION

Completion: June 1959.

- **Manufacturers Light & Heat Co.**

Project: 61 miles of 20-in. (to replace 135 miles of old 6-in.).

Status: Under way.

Contractor: **Harford Bros.**, Emporium, Pa.

Completion: Fall 1959.

- **Michigan Consolidated Gas Co.**, Detroit.

Project: 53 miles of 30-in. from near Milford to Elsie in Clinton County, Mich.

Status: Under way.

Contractor: **Williams Brothers Co.**, Tulsa.

Completion: Summer 1959.

- **Michigan Wisconsin Pipe Line Co.**, Detroit.

Project: 374.1 miles of 24-in. main line loop; 21 miles of 16-in. loop in Wis.

Status: Under way.

Contractor: **R. H. Fulton & Co.**, Lubbock, Tex., has six loops totaling 211.7 miles in Kansas, Nebraska, and Missouri; **Panama-Williams Corp.**, Houston, has two loops in Iowa and one in Illinois totaling 124.2 miles; **Somerville Construction Co.**, Ada, Mich., has two loops in Michigan totaling 38.2 miles.

Completion: July 1, 1959.

Project: 134.4 miles of 24-in., 27.9 miles of 20-in., 96.3 miles of 16-in., and 118 miles of smaller diameter lines, in Wisconsin and Michigan.

Status: Pending FPC approval.

Completion: 1960.

- **Midwestern Gas Transmission Co.**, Houston.

Project: 350 miles of 30-in. from Portland, Tenn., to Joliet, Ill.

Status: Pending FPC approval.

Completion: Planned for 1959.

Project: 504 miles of 24-in. from Emerson, Man., to Marshfield, Wis., plus 54 miles of sales laterals.

Status: Pending FPC approval.

Completion: 1960.

- **Mississippi River Transmission Corp.** (Mississippi River Fuel Corp.), St. Louis.

Project: 115 miles of 24-in. from near Oran in southeast Mo., north between Ste. Genevieve and Bonne Terre into vicinity of Herculaneum and Pevely then into St. Louis Co.

Status: Planned.

Completion: Last half 1960.

- **Mountain Fuel Supply Co.**, Salt Lake City.

Project: 24.4 miles of 20-in. loop in Utah, plus 5 miles of 8-in. lateral.

Status: Pending FPC approval.

- **New York State Natural Gas Corp.**, Pittsburgh.

Project: 43 miles of 20-in. from Kittanning to Luthersburg, Pa.

Project: 14.5 miles of 26-in. from Chatham Township to Lawrenceville, Pa.

Status: Planned.

Completion: 1959.

Project: 20 miles of 20-in. in Tioga County, Pa., and 18 miles of takeup.

Status: Under way.

Contractor: **Williams Brothers Co.**, Tulsa.

Completion: June 1, 1959.

- **Niagara Mohawk Power Corp.**, Syracuse, N. Y.

Project: 100 miles of 12-in. from Watertown to Massena, N. Y.

Status: Under way.

Contractor: **Fulghum Contracting Corp.**, Harrisburg, Pa.

Completion: August 1, 1959.

Project: 16.5 miles of 12-in. from Pierrepont Manor to Watertown, N. Y.

Status: Under way.

Contractor: **Fulghum Contracting Corp.**

Completion: June 30, 1959.

Project: 5.5 miles of 20-in. from Cicero to Syracuse, N. Y.

Completion: July 31, 1959.

- **Northern Illinois Gas Co.**

Project: 140 miles of 22-in. from Des Plaines to East Dubuque, Ill.

Status: Approved.

- **Northern Natural Gas Co.**, Omaha, Neb.

Project: 217 miles of main line, 221 miles of main-line loops, 1,906 miles of branch lines of various diameters.

Status: Pending FPC approval.

Completion: 1959-61.

Project: 18 miles of 20-in. from Dubuque, Iowa, to Menominee, Ill.

Status: Under way.

Contractor: **Williams Brothers Co.**, Tulsa.

Project 19 miles of 30-in. from Oakland to Ogden, Iowa.

Status: Approved.

Project: 9 miles of 30-in. from Palmyra to Beatrice, Neb.

Status: Approved.

Project: 11 miles of 30-in. from Clifton to Tescott, Kans.

Status: Approved.

Project: 8 miles of 30-in. from Tescott to Bushton, Kans.

Status: Approved.

Project: 11 miles of 30-in. from Sunray, Tex., to Beaver, Okla.

Status: Under way.

Contractor: **R. H. Fulton & Co.**, Lubbock, Tex.

Project: 8 miles of 30-in. from Beaver, Okla., to Mullinville, Kans.

Status: Under way.

Contractor: **R. H. Fulton & Co.**, Lubbock, Tex.

Project: 169 miles of 20-in. from Farmington, Minn., to Superior, Wis.

Status: Pending FPC approval.

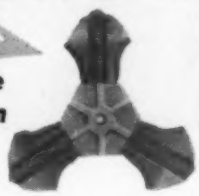
Project: 23 miles of 24-in. main line loop in Neb.

Status: Pending PFC approval.

Project: 44 miles of 16-in. in Duluth-Su-

Grip-Tite

NEW and IMPROVED POSITIVE EXPANDING ANCHOR



Here Are "Dead Men THAT HOLD!"

Quicker! Stronger! Use Grip-Tite Expanding Anchors for "Dead Men That Hold!" Use for portable drilling mast, well servicing mast, pulling truck, floor blocks, derrick guy wires.

30 YEARS OF OIL FIELD USE!

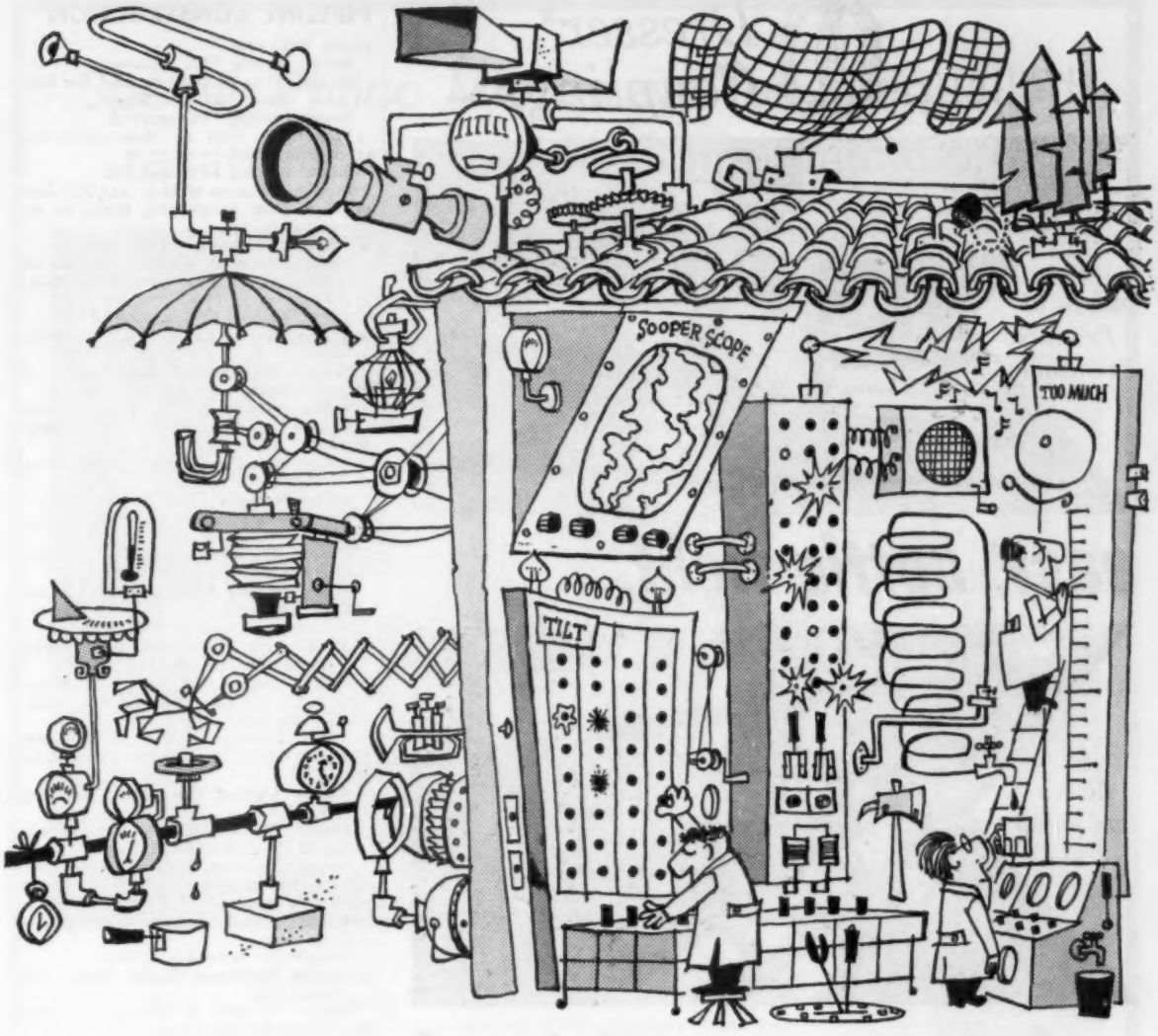
Grip-Tite Anchors have fail-safe construction, with positive lock-open expansion. Made of long lived certified malleable iron. All rods have 3" I.D. Eye.

Come To Us With Your Anchoring Problems

EXPANDING Grip-Tite ANCHORS

Grip-Tite MANUFACTURING CO.

BOX 111 • WINTERSET, IOWA



How much control does your pipeline need?

If you have some imagination, like our artist, you can go hog-wild in working out a pipeline control system. If you really wanted it, Union Switch & Signal could even give you a digital read-out of your mother-in-law's blood pressure a thousand miles away.

But clean engineering requires just the right amount of control. We've learned, after 78 years of hard knocks in the control business, that overdesign is just as bad as underdesign. We all strive for positive, reliable, informative, labor-saving control. No more. No less.

Union Centralized Transport Control can remotely operate a single booster station or an entire system. It can provide automatic sequencing, telemetering, data handling and display, data logging, instrumentation and communications.

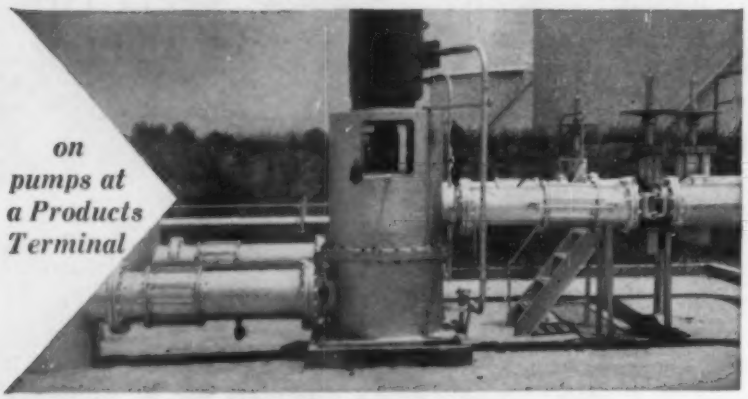
Union CTC will lower your operating costs, and it is completely error-free. It's a new concept in pipeline control. Write to us so we can tell you about it.

See us at: IPE—Tulsa. May 14-23. Sec. R-Oklahoma Drive

"Pioneers in Push-Button Science"

UNION SWITCH & SIGNAL
DIVISION OF WESTINGHOUSE AIR BRAKE COMPANY
PITTSBURGH 18, PENNSYLVANIA

Dresser® Couplings—



on pumps at a Products Terminal

easy, bottle-tight...

on filters and pump lines

safe, permanent joints!

Dresser Couplings are easily installed and bottle-tight for life! The specially compounded Dresser Gasket provides rugged "give and take" to absorb vibration, settlement and other stresses that might cause damage. And there's no pipe threading. With plain end pipe, any workman can install Dresser Couplings in an average two man-minutes per bolt *using only a wrench.* And even with pipe deflection up to 4°, you still get a perfect Dresser-Coupled joint. Send for Dresser Catalog No. 531; it contains more detailed information and complete specifications on *all* Dresser Couplings, Fittings and Pipe Repair Products.

• GET THEM FROM YOUR LOCAL OIL FIELD SUPPLY STORE

Bradford, Pennsylvania
Chicago
Houston
Philadelphia
New York
S. San Francisco
Toronto & Calgary

DRESSER
MANUFACTURING DIVISION

ONE OF THE DRESSER INDUSTRIES

PIPELINE CONSTRUCTION

perior, Wis., area.
Status: Pending FPC approval.
Project: 57 miles of 30-in. main line loop in Iowa, Minn., Neb. and Kans.
Status: Pending FPC approval.
Project: 21 miles of 16-in. connecting Glick field, Kans.
Status: Pending FPC approval.
Project: 188 miles of 24-in. and 215 miles of 30-in. from Farmington, Minn., to International border.

• **Offshore Gathering Corp.,** Houston.
Project: 364 miles in Gulf of Mexico off La.: 60 miles of 24-in., 70 miles of 26-in., and 234 miles of 30-in. dual line.
Status: Pending FPC approval.

• **Pacific Gas & Electric Co.,** San Francisco.
Project: 131 miles of 34-in. looping of Topock-Milpitas main line.
Status: Planned. Pending FPC approval.
Completion: 49 miles in 1959; 82 miles in 1960.
Project: 42 miles of 30-in. from Pittsburg to Irvington, Calif.
Status: Planned.
Completion: 11 miles in 1959; 31 miles in 1960.
Project: 296 miles of 36-in. from Klammath Falls, Ore., to Antioch, Calif.
Status: Pending Canadian export permit and FPC approval.
Completion: December 1960.

• **Pacific Gas Transmission Co.** (Pacific Gas & Electric, San Francisco).
Project: 614 miles of 36-in. from Kingsgate, B. C., to California border near Klammath Falls, Ore.
Status: Pending approval of FPC and Canadian authorities to import gas. To start late 1959.

• **Pacific Lighting Gas Supply Co.,** Los Angeles.
Project: 128 miles of 34-in. from Topock, Ariz., to Newberry, Calif.
Status: California Public Utilities Commission has granted certificate contingent upon FPC approval of Transwestern Pipeline Co.'s proposed project terminating at Topock, Ariz.
Completion: November 1, 1959.

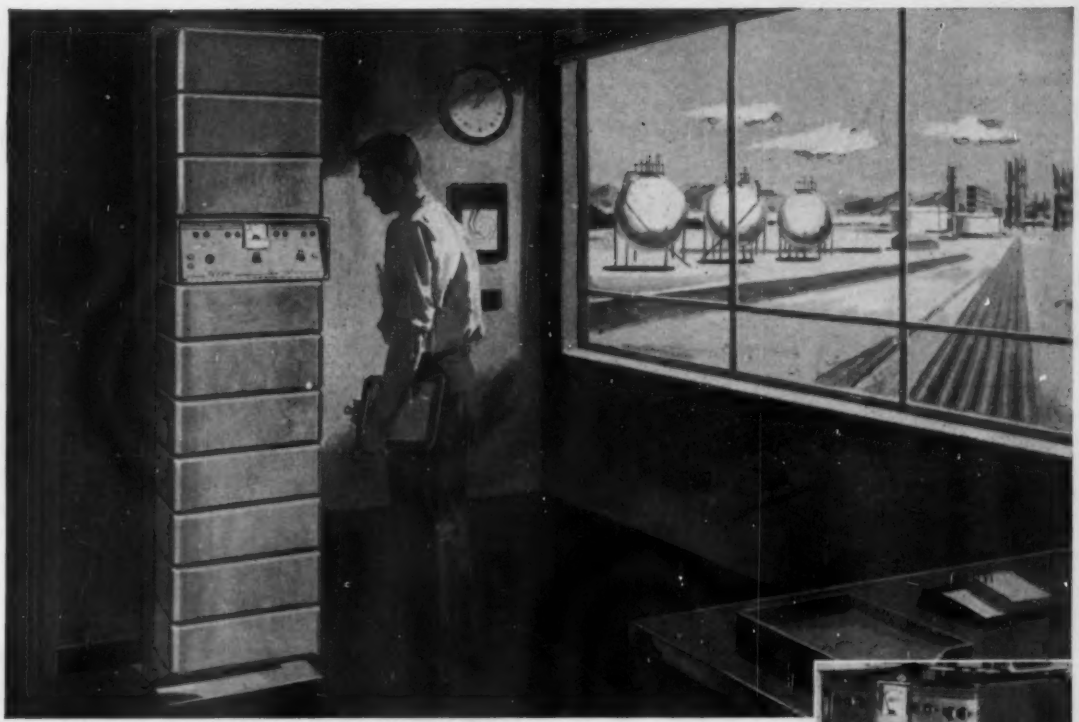
• **Pacific Northwest Pipeline Corp.,** Salt Lake City.
Project: 17 miles of 30-in. loop of Spokane-Coeur d'Alene lateral.
Status: Pending FPC approval.
Completion: 1961.

• **Panhandle Eastern Pipe Line Co.,** Kansas City.
Project: 16 miles of 10, 13 miles of 6, 40 miles of 4, and 1 mile of 2-in. gathering line.
Status: Planned.
Contractor: **Hall Construction Co.**
Completion: Dec. 31, 1959.

• **Pennsylvania Gas Co.,** Warren, Pa.
Project: 23 miles of 10-in. in Erie Co., Pa., 15 miles of 8-in. in Warren and Chautauqua counties, Pa.; 30 miles of branch lines, and several small distribution lines.
Status: Approved.

• **Peoples Natural Gas Co.,** Pittsburgh.
Project: 30 miles of 20-in. from Bentleyville to Imperial, Pa.
Status: Planned.
Contractor: **Coates Field Service, Inc.,** Oklahoma City, has right-of-way acquisition.
Completion: September 1, 1959.
Project: 25 miles of 24-in. from Waynesburg, Pa., to W. Va. line near Garrison, Pa.
Status: Under way.
Contractor: **H. L. Gentry Construction Co.,** Jackson, Mich.
Completion: September 1, 1959.
Project: 14 miles of 12-in. from town to Seven Springs, Pa.

Specify Philco Microwave for unequalled reliability in Pipeline Communications



Featuring the revolutionary CLR-9 duplex terminal, with wideband composite signal, Philco Microwave Systems insure highly dependable, unattended, point-to-point communications for voice, telemetering, VHF maintenance and inter-site voice . . . plus high speed data transmission and supervisory control.

The CLR-9, which operates in the 6000 mc to 8000 mc bands, consists of a highly stable, FM, reflex klystron transmitter and a low-noise superheterodyne receiver. Continuous operation is assured by the automatic switching to the integrated standby which is kept in continuous operation with the primary unit.

The unitized construction of the CLR-9 provides the utmost in flexibility and ease of maintenance through plug-in printed wiring chassis. In addition, metering and test circuits are built in and centrally located on the control panel.

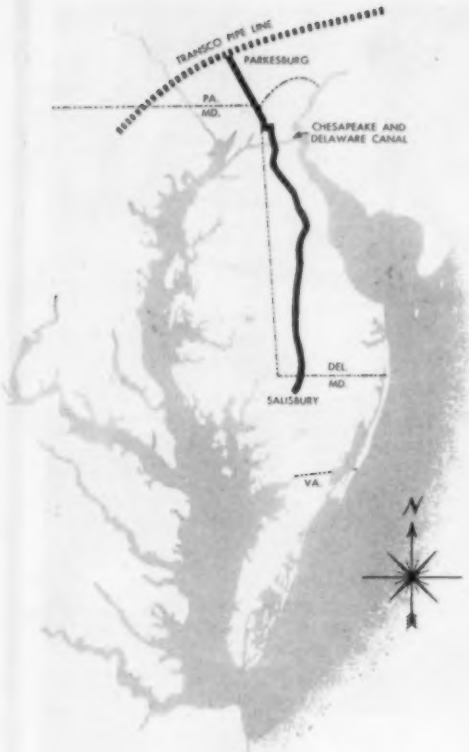
For reliable, economical, maintenance-free microwave communications . . . specify Philco. *Government and Industrial Division, 4700 Wissahickon Avenue, Philadelphia 44, Pennsylvania. In Canada: Philco Corporation of Canada Limited, Don Mills, Ontario.*

- Plug-in Printed Wiring Chassis
- Expandable—Wide Bandwidth Suitable for Computer Control and Data Transmission
- Convection Cooled Klystrons—No Blowers
- Built-in Metering and Test Circuits—in a Single Test Panel
- Compatible with all Multiplex Equipment
- 240 Voice Channels

PLUG-IN PRINTED WIRING CHASSIS —are replaced quickly, providing utmost ease of maintenance; printed wiring panels give increased circuit stability.

PHILCO QUALITY FIRST!

Eastern Shore's New Gas Line



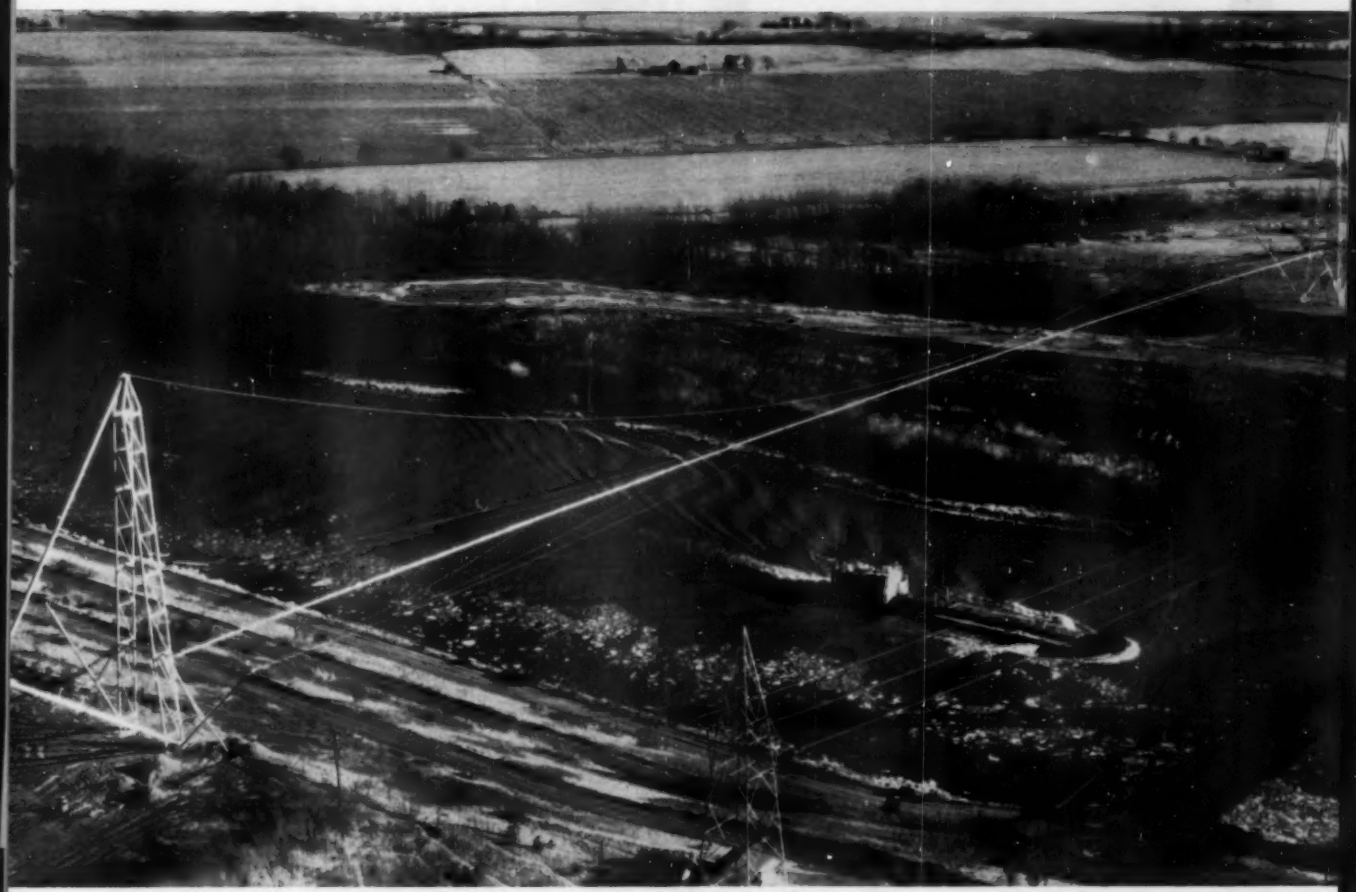
WITH the erection of this 1280 ft pipeline suspension bridge over the Chesapeake and Delaware Canal near Newark, Del., Eastern Shore Natural Gas Company's new 124-mile pipeline was completed and ready to serve waiting customers. The entire line had been laid and tested prior to the canal crossing, which linked-up the 8⅝-in. OD northern section with the smaller 6⅝-in. OD southern section.

Built with Bethlehem steel pipe—some 5,000 tons of it—the new line taps Transco's main line near Parkesburg, Pa., and runs as far south as Salisbury, Md. The line was installed by Buchanan Pipe Line Company. Over-all advisory services were supplied by Stone & Webster Service Corporation.

Transco's 36-in. OD looping line in southeastern Pennsylvania also required many tons of Bethlehem pipe. Looping along the entire length of the trunk greatly increased Transco's capacity.

Expert handling together with the uniform quality of Bethlehem pipe speeded installation of Eastern Shore's new pipeline. Noland Co., Inc., Washington, D. C., was the jobber.

Leaps 1280 ft Across Canal



Need Line Pipe? Bethlehem makes hydraulically expanded electric fusion-weld pipe from 18-in. through 42-in. OD, in 40-ft lengths; electric resistance-weld pipe from 5 in. (nom.) to 16 in. OD, in lengths to 60 ft; and continuous buttweld pipe ½ in. to 4 in. (nom.) in various lengths. All Bethlehem steel pipe meets the appropriate API specifications.

Contact the nearest Bethlehem Steel sales office for full information. Our engineers will be glad to assist you.

▲ QUARTER-MILE SPAN

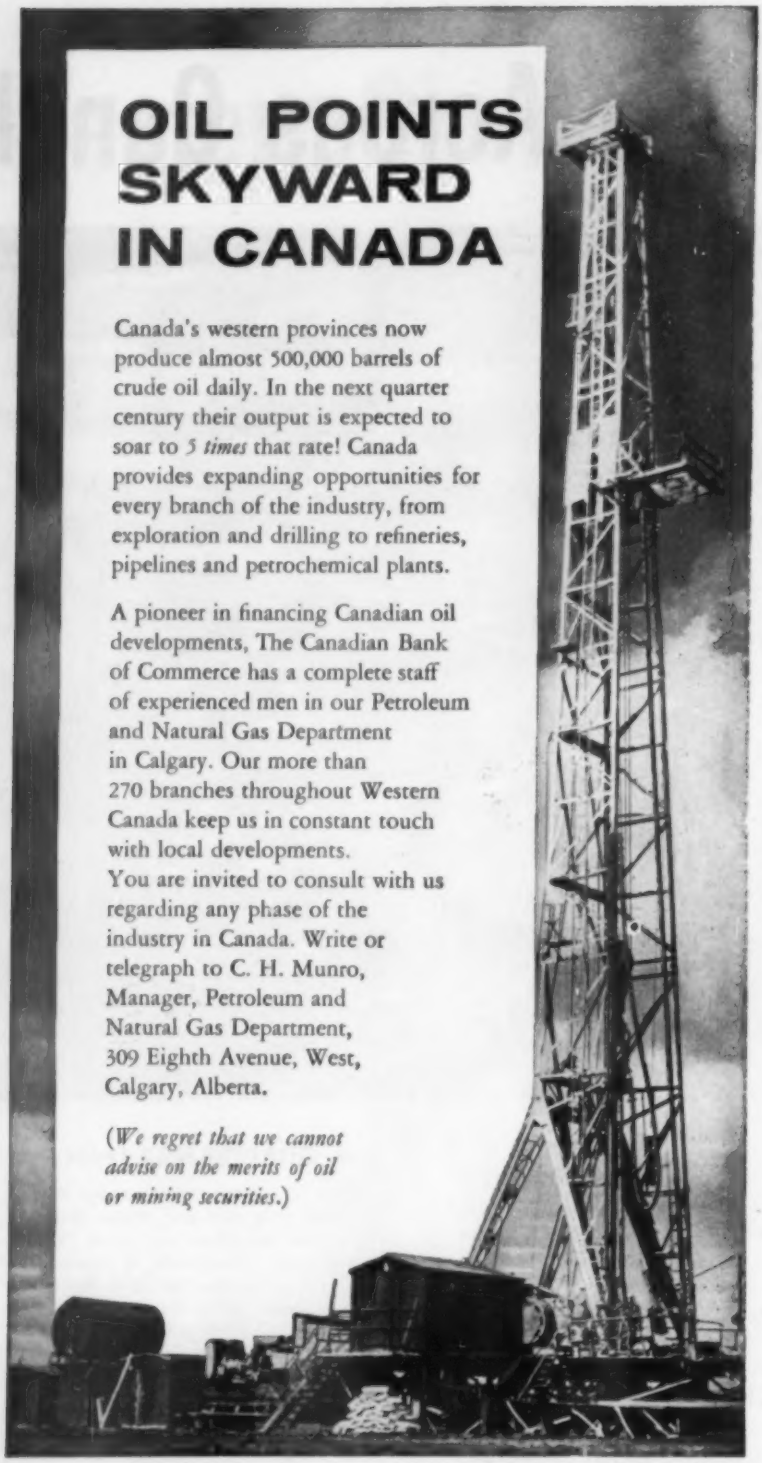
Two 50-ton towers, plus strong Bethlehem wire rope and bridge strand, support the 12-in. steel pipe 140-ft above the Chesapeake & Delaware Canal. The structure was designed by Clear Span Engineering Co., Houston, and erected by Midwestern Contractors, Inc., Wheaton, Ill. The tubular steel towers were fabricated by Trinity Steel Company, Dallas, Tex.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BETHLEHEM STEEL



OIL POINTS SKYWARD IN CANADA

Canada's western provinces now produce almost 500,000 barrels of crude oil daily. In the next quarter century their output is expected to soar to *5 times* that rate! Canada provides expanding opportunities for every branch of the industry, from exploration and drilling to refineries, pipelines and petrochemical plants.

A pioneer in financing Canadian oil developments, The Canadian Bank of Commerce has a complete staff of experienced men in our Petroleum and Natural Gas Department in Calgary. Our more than 270 branches throughout Western Canada keep us in constant touch with local developments. You are invited to consult with us regarding any phase of the industry in Canada. Write or telegraph to C. H. Munro, Manager, Petroleum and Natural Gas Department, 309 Eighth Avenue, West, Calgary, Alberta.

(*We regret that we cannot advise on the merits of oil or mining securities.*)

THE CANADIAN BANK OF COMMERCE

Head Office Toronto 1, Canada

New York • San Francisco • Los Angeles • Seattle • Portland, Ore.
London, England, West Indies and Nassau, Bahamas
Resident Representatives: Chicago—Dallas and more than 800 branches across Canada

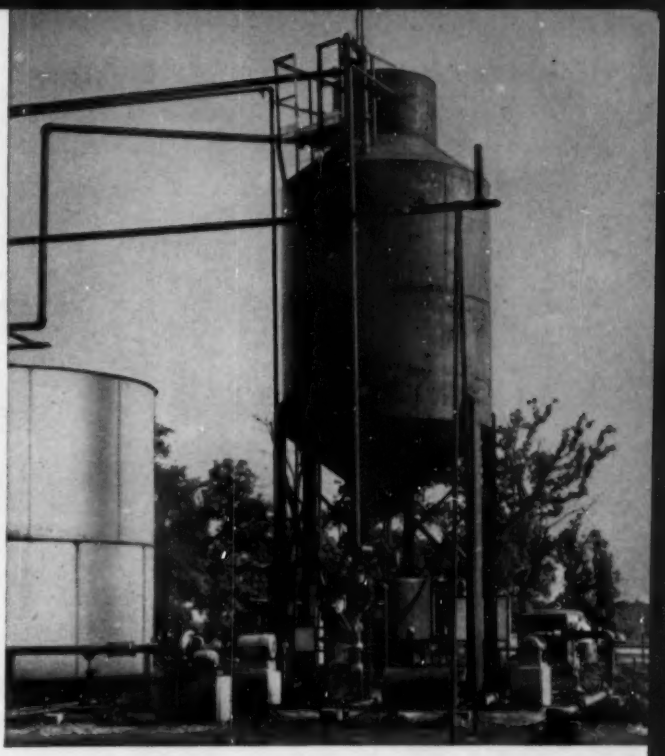
PIPELINE CONSTRUCTION

Status: Planned.
Completion: September 1, 1959.

- **Permian Basin Pipeline Co.,** Omaha, Neb.
Project: 83 miles of 16-in. from the Pioneer gathering line in Schleicher County, Tex., to Spraberry, Tex.
Status: Pending FPC approval.
Completion: Fall 1959.
- **Phillips Petroleum Co.,** Bartlesville, Okla.
Project: Undetermined mileage of gathering lines, Garvin County, Okla.
Contractor: **George W. Davis.**
Completion: Oct. 1, 1959.
- **Piedmont Gas Co., Hickory, N. C.**
Project: 78 miles of 2 to 8-in. extension off Transcontinental in N. C., to serve Gaston, Lincoln, Catawba, Caldwell, and Burke counties.
Status: Approved.
- **Pioneer Natural Gas Co.,** Amarillo Tex.
Project: 21 miles of 12-in. from Sudan to Muleshoe, Tex.
Status: Pending FPC approval.
Project: 12 miles of 10-in. from Muleshoe, Tex., northward.
Status: Pending FPC approval.
- **Richfield Oil Corp.,** Los Angeles.
Project: 60 miles of 20-in. from Cuyama Valley to Ventura, Calif.
Status: Under way.
Contractor: **Alex Robertson Co.,** Paramount, Calif.
Completion: Summer 1959.
- **Rio Gas Gathering Co.,** San Antonio, Tex.
Project: 97 miles of 3 to 8-in. gathering line in Hidalgo County, Tex.
Status: Pending FPC approval.
Completion: 1959.
- **Signal Oil & Gas Co., Los Angeles.**
Project: Extension of gathering system from Tioga, N. D., to near the Canadian border in Burke Co.
Status: Proposed.
- **Southern California Gas Co.** and **Southern Counties Gas Co., Los Angeles.**
Project: 206 miles of 34-in. from Ivanpah Lake to Placentia, Calif.
Status: Planned.
Completion: December 1959.
- **Southern Counties Gas Co.,** Los Angeles.
Project: 13.5 miles of 30-in. from Santa Ana to Huntington Beach power plant.
Status: Under way.
Contractor: **Pacific Pipeline Co.,** Los Angeles.
Completion: May 1, 1959.
- **Southern Natural Gas Co.,** Birmingham, Ala.
Project: 47.9 miles of 16-in. from Montegut field to Toca station and 6.4 miles of 6-in. from South Lake Long field to Montegut field.
Status: Approved.
Completion: Nov. 1, 1959.
Project: 44.9 miles of 24-in., and 65.6 miles of 20-in., Gwinville-Ocmulgee station; 79 miles of 16-in., Ocmulgee-Wrens station; 21.8 miles of 14-in., Griffin-South Atlanta; 78.9 miles of 18-in., Gwinville-Cranfield field; 17.1 miles of 20-in., main line to Toca station; 2.3 miles of 12-in., Coffee Bay field to Lake Enfermer lateral; and 5 miles of 8-in., Sandy Hook field lateral loop.
Status: Pending FPC approval.
Completion: Nov. 1, 1959.
Project: 11 miles of 8-in. from Atoka Penn field to Artesia Junction, N. M.
Status: Planned.
Completion: June 30, 1959.
- **South Georgia Natural Gas Co.,** Thomasville, Ga.
Project: Lines in Ga.: 2 miles of 2-in. near Meigs; 31 miles of 3-in. near Nash-

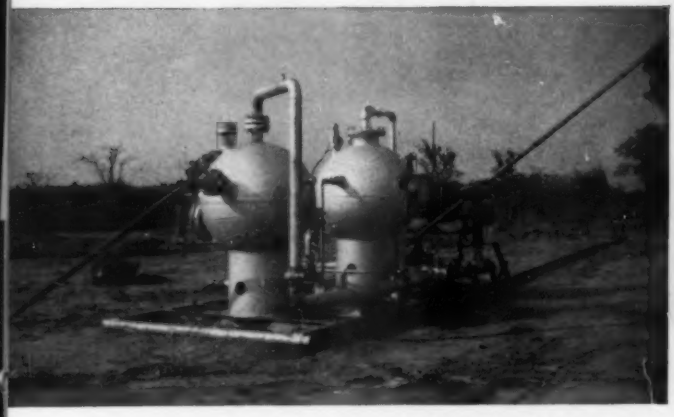
Integrated Production Systems for

LEASE AUTOMATIC CUSTODY TRANSFER



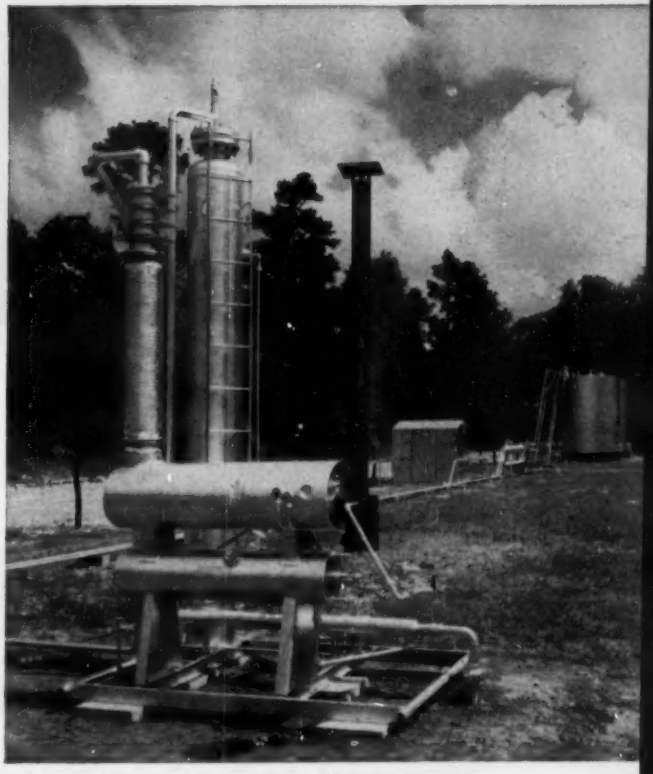
Since lease automatic custody transfer is the key to complete automation at the wellhead, and hence the key to cost reduction, the dependability of the LACT equipment is particularly important. Graver offers two thoroughly proved integrated production systems: Type I features intermittant flow, with capacities from 1150 to 5850 bbl./day. Type II provides continuous flow in capacities from 2000 to 5850 bbl./day. Ask for folder describing the dependable Graver systems.

3 Stars for Your Cost-Cutting Program



Above TWO-STAGE SPHERICAL SEPARATOR UNIT

A favorite when skid mounted as above for well-testing, this separator unit consists of spherical separators with capacities of 1200 lb. W.P. and 125 lb. W.P. and a gas meter run. Such units are rented for testing prior to installing permanent equipment.



Right GLYCODRATOR FOR GAS DEHYDRATION

The Graver Glycodrator removes moisture from the gas stream coming from the well. The tanks in the background are used for storing the distillate recovery from the gas stream. The Glycodrator is one of many types of oil and gas field equipment made by Graver.

GRAVER®

Oil and Gas Equipment Division

GRAVER TANK & MFG. CO.

DIVISION—UNION TANK CAR COMPANY

P.O. BOX 546, SAND SPRINGS (TULSA), OKLA.

Exterior view of Utica Station.

The three compact 6-cylinder Cooper-Bessemer GMVC Compressors are rated 1000 hp at 300 rpm. Two have been in service since 1957. One was added in 1959.

Victor G. Fulkerson, *Head Engineer, Utica Station, New York State Natural Gas Corporation, explains...*

How the new Utica Station meets growing demands with Cooper-Bessemer Compressors

"Our Utica Station was built in 1957 to boost gas pressure for the mounting demands of the Albany-Schenectady area. It housed two 1000 hp Cooper-Bessemer Series-Turbocharged V-Angle Compressors. Then, a demand for 20 million cubic feet more gas daily required the addition of a third unit of the same type and size this year (1959).

"Averaging about 85 million cubic feet per 24 hours, the station has pumped peak loads of as much as 140 million cubic feet. Entering the station at 400-700 psi, the gas is discharged at 600-900 psi."

FACTS ABOUT COOPER-BESSEMER SERIES-TURBOCHARGED V-ANGLE COMPRESSORS

Peak Load—Plus Capacity. Plenty of reserve power, always ready for those unexpected extra demands, provides a big economy advantage.

Low Fuel Consumption. Guaranteed not to exceed 7200 Btu/bhp-hr at full load!

Less Housing Cost. Compact V-angle design, combined with 40% power increase of series turbocharging, means today's highest power-to-space ratio, with no increase in piping or cooling requirements.

Minimum Oil Consumption. Cooper-Bessemer "cocktail-shaker" piston cooling, precision-honed cylinders, and advanced piston and ring design, combined with highly efficient, full-flow filtration, results in exceptional lube oil economy.

Low Maintenance. Many factors contribute to records of trouble-free performance—the simplicity of V-angle 2-cycle design, fewer moving parts, accessibility, conservative ratings, and, extremely significant, vibrationless operation.

Write For Bulletins. Complete details on Cooper-Bessemer V-Angle Compressors are given in bulletins... free on request. Call our nearest office to help you plan new facilities.

BRANCH OFFICES: Grove City • New York • Washington • Gloucester • Chicago • Minneapolis St. Louis • Kansas City • Tulsa • New Orleans • Shreveport • Houston • Greggton • Dallas • Odessa Pampa • Casper • Seattle • San Francisco • Los Angeles

SUBSIDIARIES: Cooper-Bessemer of Canada, Ltd.... Edmonton • Calgary • Toronto • Halifax
C-B Southern, Inc.... Houston
Cooper-Bessemer International Corporation... New York • Caracas • Mexico City
Cooper-Bessemer, S.A.... Zurich, Switzerland

Cooper Bessemer

GENERAL OFFICES: MOUNT VERNON, OHIO

ENGINES: GAS - DIESEL - GAS-DIESEL
COMPRESSORS: RECIPROCATING AND CENTRIFUGAL
ENGINE OR MOTOR DRIVEN

PIPELINE CONSTRUCTION

ville; 41 miles of 4-in. and 39 miles of 6-in. near Tifton.
Status: Planned.
Completion: Summer 1959.

- **South Texas Natural Gas Gathering Co.** (Coastal States Gas Producing Co., Corpus Christi, Tex.)

Project: A 60-mile line from existing system to steam generating plant in Pearsall County, Tex.
Status: Planned.
Completion: January 1960.

- **Tennessee Gas Transmission Co.,** Houston.

Project: 21 miles of 16-in. and 2 miles of 12-in. to offshore La. fields.
Project: 158 miles of 36-in. loop in La. and Miss.
Status: Approved.
Completion: Planned for 1959.

- **Tensas Gas Gathering Corp.**

Project: 37 miles of 2 to 8-in. from Rodney field, Miss., westerly to connect with Olin Gas Transmission Co.'s line in Tensas Parish, La.
Status: Approved.

- **Texas Eastern Transmission Corp.,** Shreveport, La.

Project: 13 miles of 30-in. from Grennup Co., Ky., to Scioto Co., Ohio; 16 miles of 30-in. from Noble Co. to Monroe Co., Ohio.
Status: Pending FPC approval.
Completion: 1959.
Project: 13 miles of 30-in. in Bucks Co., Pa.; 81 miles of 24-in. from Leidy Storage field to Perulack Station, Pa.; 66 miles of 30-in. from Delmont, Pa., to Lambertville, N. Y.; 23 miles of 20-in. from Station 25 to Chester Junction, Pa.
Status: Pending FPC approval.
Completion: 1959.
Project: 40 miles of 36-in. from Station 26 to Station 27 in N. J., and 4 miles of 30-in. from Station 27, N. J., to Staten Island, N. Y.
Status: Pending FPC approval.
Completion: 1959.

- **Texas Gas Transmission Corp.,** Owensboro, Ky.

Project: 35 miles of 30-in. on Bastrop-Eunice, La., line and 10 miles of 30-in. in Arkansas.
Status: Under way.
Contractor: **Houston Contracting Co.**
Completion: Aug. 1, 1959.
Project: 19 miles of 26-in. in Kentucky and 20 miles of 30-in. in Mississippi.
Status: Under way.
Contractor: **Western Pipe Line, Inc.,** Austin, Tex.
Completion: July 1, 1959.
Project: 82 miles of 26-in. loop in Kentucky and 164 miles of 30-in. in Louisiana, Arkansas, Mississippi, Tennessee, and Kentucky.
Project: Roanoke-Grand Cheniere line, La., 32 miles of 12-in., with 32-mile 3-in. oil line; Grand Cheniere-Block 9, E. Cameron, La., 11.4 miles on 14-in. with 11.4 miles of 4-in. oil line; Grand Cheniere-Block 33, W. Cameron area, 7.9 miles of 14-in., with 7.9 miles of 4-in. oil line; Baldwin-Bayou Pigeon, La., 17 miles of 12-in.; Youngsville-Abbeville line, 11 miles of 8-in.; Abbeville-Perry line, 6 miles of 6-in.; South Rayne-Hope Natural line, 3 miles of 6-in.; Iowa-Hope Natural line, 1.8 miles of 2-in.; Jefferson Island-Hope Natural, La., line, 1 mile of 4-in.
Status: Pending FPC approval.

- **Texas Illinois Natural Gas Pipeline Co.,** Chicago.

Project: 860 miles of 30-in. looping of present system.
Status: Planned.
Completion: 1960-1961.

- **Transcontinental Gas Pipe Line Corp.,** Houston.

Project: 38 miles of 30-in., 58 miles of 36-in., and 18 miles of 20-in. loops, and 64 miles of 8/24-in. gathering lines.
Status: Pending FPC approval.
Completion: Fall 1959.
Project: 45 miles of 30-in .and 78 miles of 36-in. loop.
Status: Pending FPC approval.
Completion: Fall 1960.
Project: 15 miles of 16-in. and a shorter 12-in. line to Block 71 and Block 76 fields off Vermilion Parish, La.
Status: Approved.
Completion: 1959.

- **Transwestern Pipe Line Co.** (Warren Petroleum, Monterey Oil Co., J. R. Butler), Houston.

Project: 635 miles of 24-in. from Perryton and Fort Stockton, Tex., to Roswell, N. M., and 670 miles of 30-in. from Roswell to Topock, Ariz.
Status: Pending FPC approval.
Completion: Mid-1959.

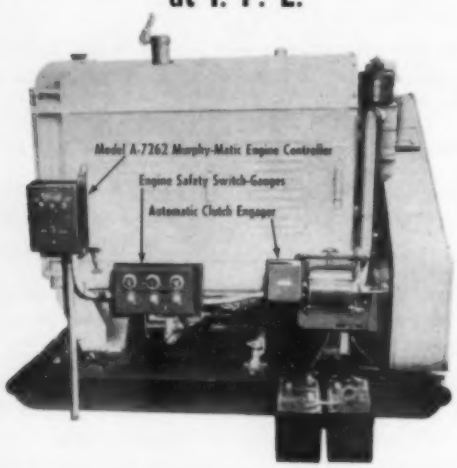
- **Trunkline Gas Co.,** Houston.

Project: 45 miles of 24-in. from Moss Hill to Silsbee, Tex.
Status: Denied by FPC examiner.
Project: 115 miles of 30-in. from Pitkin to Riverton, La.
Status: Planned. Pending FPC approval.
Completion: July 1959.
Project: 119 miles of 30-in. from Kilborne, La., to Ballentine, Miss.
Status: Planned. Pending FPC approval.
Completion: September 1959.
Project: 117 miles of 30-in. from Canadaville, Tenn., to Bardwell, Ky.

MURPHY

See

Safety and Automation Switch-Gauges at I. P. E.



Pictured above — fully automatic pipeline pump — Murphy-controlled.

Be sure to visit our International Petroleum Exposition Exhibit in the California Building . . . and our plant at

3131 South Sheridan Road in Tulsa

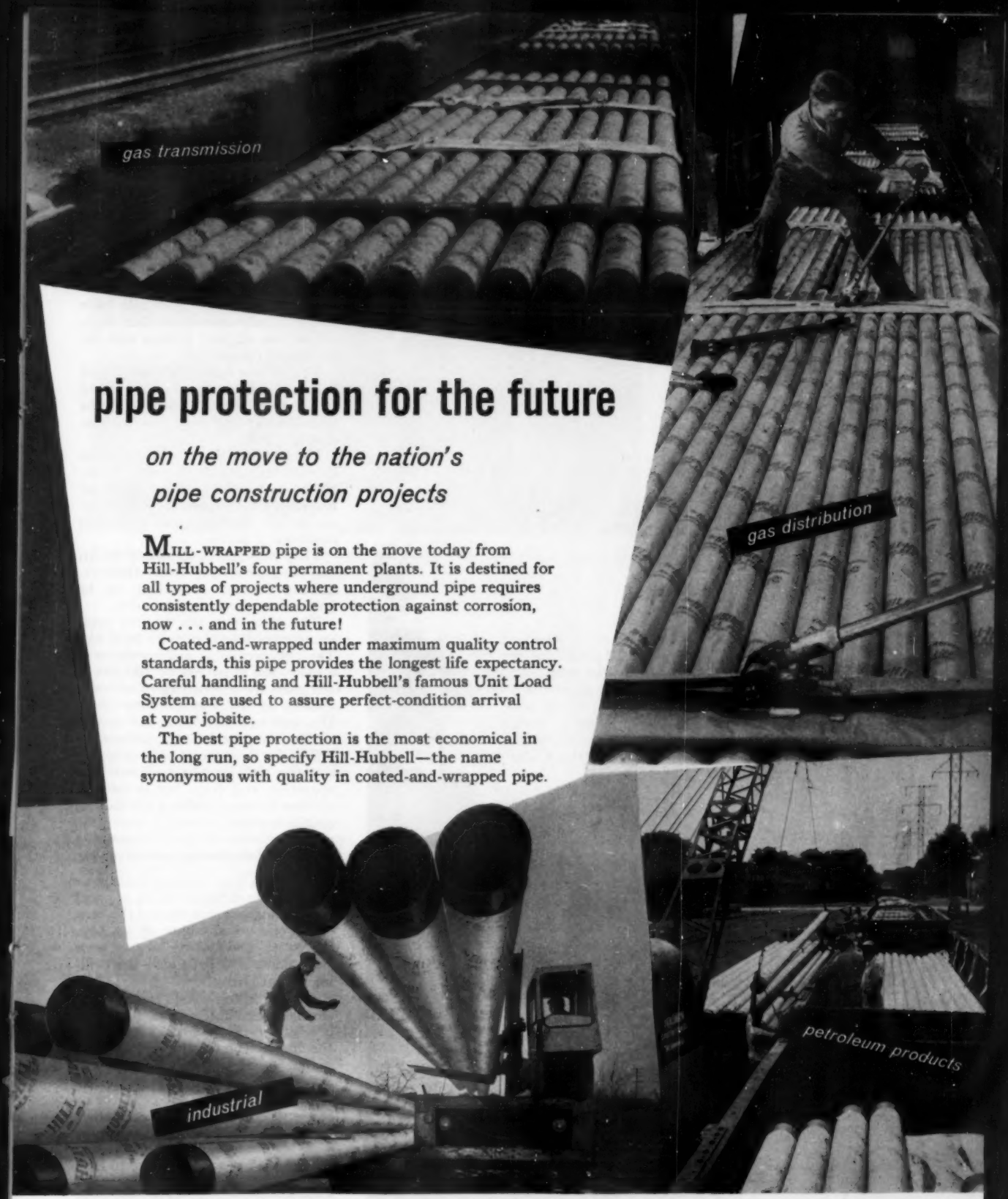
Most complete line of Automation controls for Oil and Water level, Water, Gas and Oil Temperatures, Gas Compressors, Water Flood and Pipeline Pump Stations.

Safety fuel valves for Diesel and Gas
Custom made panels to your specifications

See our ad in COMPOSITE CATALOG

FRANK W. MURPHY MANUFACTURER, INC.
RANCH ACRES STATION
TULSA, OKLAHOMA

MURPHY SAFETY SWITCH OF CALIFORNIA
11812 Davenport Road • Los Alamitos, Calif.



pipe protection for the future

on the move to the nation's pipe construction projects

MILL-WRAPPED pipe is on the move today from Hill-Hubbell's four permanent plants. It is destined for all types of projects where underground pipe requires consistently dependable protection against corrosion, now . . . and in the future!

Coated-and-wrapped under maximum quality control standards, this pipe provides the longest life expectancy. Careful handling and Hill-Hubbell's famous Unit Load System are used to assure perfect-condition arrival at your jobsite.

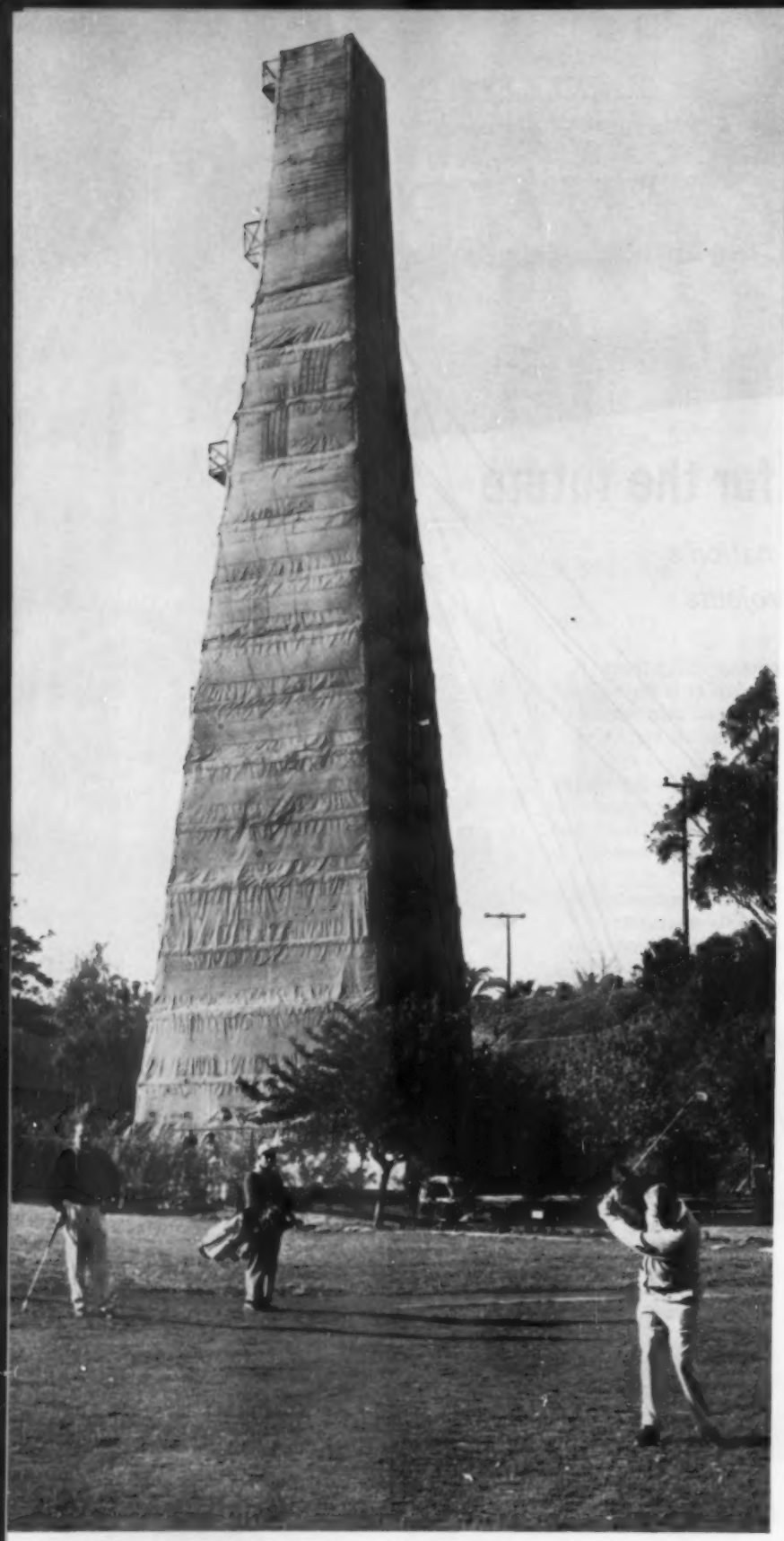
The best pipe protection is the most economical in the long run, so specify Hill-Hubbell—the name synonymous with quality in coated-and-wrapped pipe.

Specify Hill-Hubbell wrapped pipe on your next job . . .

HILL·HUBBELL

FACTORY APPLICATORS OF COATINGS AND WRAPPINGS

HILL-HUBBELL & CO. • 3091 MAYFIELD RD. • CLEVELAND 18, OHIO



Golf goes on unhampered by Signal Oil and Gas Company's drilling operations at an exclusive Los Angeles club.

Pittsburgh Seamless At Work As . . .

Signal Oil

Pittsburgh Steel Co. Casing Scores on Cramped Golf Course Location in Los Angeles

Safety "hard hats" and golf balls aren't usually associated, but then, neither are oil well drilling and the fine art of camouflage.

Yet, all four figured in when Signal Oil and Gas Company started drilling for oil from a tiny "island" in the middle of an exclusive Los Angeles country club.

Before it could put drilling crews in the fashionable Beverly Hills-West Los Angeles section, Signal and Richfield Oil Corporation—its affiliate in the venture—had a host of problems to solve.

They were smack up against tough Los Angeles zoning restrictions requiring drilling operations to be both sound and sight-proofed.

The area over the 40-acre community holding is heavily built up. The only available drilling site was a plot—less than 100 by 100 feet—alongside the left boundary of No. 1 fairway at Hillcrest Country Club. The well was to bottom out nearly a mile from the drilling platform.

Signal's first move was to scoop out the drilling site to lower the operation and thus, better conceal it. The 140-foot drilling rig had its profile spruced up and then was promptly and completely enclosed with sound-deadening padded plastic.

• **Sky-blue Top**—Next, a landscaper applied nine different colors of paint—from foliage green around the base of the rig to sky-blue at its top. Big trees and other foliage were transplanted to help hide the drilling operation.

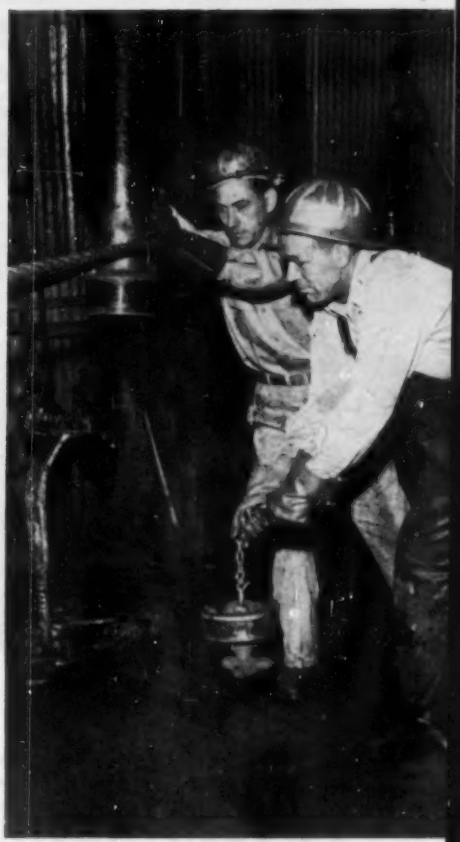
Instead of the usual Diesel power, electric units specially designed for quiet operation were set up. After the first well on the site was spudded in, waste materials had to be trucked out, but only during daylight hours.

Country clubbers and neighboring residents quickly became accustomed to the drilling operations. And there was no interrupting the "hooks" plaguing a few of the golfers. In fact, roughnecks soon found that their hard hats furnished good protection against in-flight golf balls.

• **Start Third Well**—By the time Signal had proved the first two wells and started the third, indications were strong that the Hillcrest ven-

and Gas Co. Drills Off The First Tee

Pittsburgh Steel's Seamless Casing was run during daytime by crews who worked in sound and sight-proofed rig.



Quickie thread protectors are removed just before the length of casing is added to the 8200-foot string.

ture would develop into a good paying site.

Signal—founded in California 37 years ago and now among the leading world-wide operators—takes severe drilling angles in stride. The company claims a record established during 1958 for completing 87 wells with drift angles of more than 60 degrees.

Although Signal prefers not to publicize its specific costs, there's no hiding the fact that drilling in Los Angeles piles considerable cost on top of normal land operation costs. One oilman who knows the area maintains it costs three times as much to drill there as anywhere in the nation.

• **No Needless Gambles**—That's why Signal can't afford to take a chance on less than the best in materials and equipment it uses. Failures in either would impose extra cost penalties.

Signal has to insist on top-quality material, such as Pittsburgh Steel's Seamless Oil Country Goods. Pittsburgh's 7-inch, 23-pound J-55 Casing—meeting all API specs fully—went into the 8200-foot casing string in the third Hillcrest well. Near the top of the string, Pittsburgh's Seamless was used for tension strength; farther down, Pittsburgh's Casing provided collapse resistance.

Pittsburgh Steel is a direct supplier to Signal, combining top-quality seamless with up-to-the-minute engineering and sales service. Like Signal, Pittsburgh Steel is an oil country veteran, one with more than 50 years of producing to serve oilmen

In the remainder of the oil country, Pittsburgh Steel backs up its own service through a network of independent distributors, themselves local businessmen who know the oil industry inside and out.

To put Pittsburgh's quality consciousness and its extensive steelmaking experience at your disposal, contact Pittsburgh Steel's oil country offices or any one of its distributors listed below.

Visit IPE Booths 4, 5, 6—Texas Building

Distributor Home Offices

Bradford Supply Company
Bradford, Pennsylvania

Buckeye Supply Company
Zanesville, Ohio

C. W. Cotton Supply Company
Tulsa 5, Oklahoma

Franklin Supply Company
Denver 10, Colorado

Houston Oil Field Material Co.
Houston, Texas

Industrial Supply Company
Wichita Falls, Texas

Iverson Supply Company
Tulsa, Oklahoma

Longhorn Supply Co., Inc.
Houston 14, Texas

Lucey Export Corporation
New York 7, New York

Lucey Products Corporation
Tulsa 19, Oklahoma

McJunkin Corporation
Charleston 22, West Virginia

Midland Supply Company
Wichita 7, Kansas

Mountain Iron & Supply Co.
Wichita 2, Kansas

The Producers Supply & Tool Co.
Fort Worth 2, Texas

Production & Refining Equipment Company
Odessa, Texas

Sandy Supply Company
Wooster, Ohio

Southwest Supply Company
Pittsburgh, Pennsylvania

Superior Iron Works & Supply Co.
Shreveport, Louisiana

Tex-Tube, Inc.
Houston 7, Texas

Western Supply Company
Tulsa 1, Oklahoma

Pittsburgh Steel Company

Grant Building • Pittsburgh 30, Pa.

DISTRICT SALES OFFICES

Atlanta	Cleveland	Detroit	Los Angeles	Pittsburgh
Chicago	Dayton	Houston	New York	Tulsa
			Philadelphia	Warren, Ohio

PIPELINE CONSTRUCTION

Status: Planned. Pending FPC approval.
Completion: August 1959.
Project: 113 miles of 30-in. from Marion to Neoga, Ill.
Status: Planned. Pending FPC approval.
Completion: September 1959.
Project: 204 miles of 26-in. from Bourbon, Ill., to Vistula, Ind.
Status: Planned. Pending FPC approval.
Completion: August 1959.
Project: 45 miles of 14-in. and 32 miles of 4 to 10-in. from Hitchcock to Katy, Tex.
Status: Planned. Pending FPC approval.
Completion: June 1959.
Project: 33 miles of 20-in., 32 miles of 16-in., 9 miles of 6-in. from Lowry, La., to Block 26.
Status: Planned. Pending FPC approval.
Completion: May 1959.
Project: 34 miles of 12-in. from Lowry, La., to Block 67.
Status: Planned. Pending FPC approval.

• **United Gas Pipe Line Co.,** Shreveport.
Project: 41 miles of 30-in., 12 miles between Kiln and Gulfport, Miss., and 29 miles between Gulfport and Whistler Junction, Ala.
Status: Under way.
Contractor: **Houston Contracting Co.**
Completion: July 10, 1959.
Project: 9 miles of 16-in. to connect gas supply in Belle Isle, S. La.
Status: Pending FPC approval.
Project: 10 miles of 16-in. to connect gas supply in Four Isle Dome field, S. La.
Status: Approved.
Project: 49.6 miles of 30-in. in La. and Miss.
Status: Under way.
Contractor: **Williams Brothers Co.,** Tulsa.
Completion: July 31, 1959.
Project: 43.4 miles of 30-in., Mandeville, La., to Kiln, Miss.
Status: Under way.
Contractor: **Hallmac Construction Co.,** Houston.
Completion: July 10, 1959.

• **Valley Gas Transmission, Inc.** (Fish Engineering Corp.), Houston.
Project: 150 to 160 miles of 3 to 6-in. gathering lines to tap fields in Starr, Hidalgo, Brooks, and Jim Wells counties, Tex.
Status: Pending FPC approval.
Completion: 1959.

• **Western Slope Gas Co.** (Public Service Co. of Colorado), Denver.
Project: 2 miles of 8-in., 18 miles of 6-in., 13 miles of 4-in. extension of gathering facilities in Colorado.
Status: Planned.
Completion: 1959.
Project: 26 miles of 6-in. in Mesa and Garfield counties, Colo.
Status: Planned.
Completion: Sept. 1959.

Canadian Crude Oil Pipelines

• **Act Oils, Ltd.**
Project: A 450-mile line from the Peace River region of northern B. C. to Idewater at Kitimat, B. C.
Status: Pending British Columbia Government approval.

• **Bituminous Oil Pipeline Co.** (Royalite Oil Co., and Can-Amera Oilsands Development, Ltd.)
Project: A 250-mile line from Athabasca oil sands in northeastern Alta., to Edmonton.
Status: Proposed.
Completion: 1960.

• **Gibson Crude Oil Purchasing Co., Ltd.,** Calgary.
Project: 180-mile 8-in. line from Milligan Creek, B. C., to Grand Prairie, Alta.
Status: Permit sought from B. C. government.

• **Independent Pipe Line Co.** (Home Oil Co.), Calgary.
Project: 1,073 miles of 36-in. from Edmonton, Alta., to Superior, Wis.; 946 miles of 34-in. from Superior to Montreal, Que.; 72 miles of 16-in. and 74 miles of 10-in. feeder lines from Calgary to Bellshill Lake, Alta., on the 36-in. line.
Status: Proposed.

• **Mid-Continent Pipe Lines, Ltd.,** Edmonton, Alta.
Project: 1,500 miles of 30-in. from Edmonton to Chicago, via Sask., N. D., Minn., Wis., and Ill. U. S. section to be owned by International Oil Pipeline Corp., New York City.
Status: Pending Canadian Board of Transport Commission approval. **W. C. Gilman & Co.,** New York City, has made preliminary study.

• **Peace River Oil Pipe Line Co., Ltd.,** Calgary, Alta.
Project: 8 miles of 6-in., 45 miles of 8-in., and 17 miles of 12-in. from its Fox Creek Pump Station to Windfall, Virginia Hills, and Swan Hills fields in Alta.
Status: Approved.
Project: 220-mile, 8-in. line from Milligan Creek field, B. C., to Dawson Creek, B. C., and Sturgeon Lake, Alta.
Status: Permit sought from B. C. government.
Completion: Nov. 1, 1959.

• **Trans-Prairie Pipelines, Ltd.,** Edmonton, Alta.
Project: 6-8-in. line from Weyburn field

PROVED BY MILES & MILES & MILES &

ROYAL PRECISION

LGP-30

Twice the capacity of any computer in its class...easiest to program in basic machine language...lowest in cost

With the compact, powerful LGP-30, you can obtain peak operating efficiency through on-site linear programming...can save substantially on every barrel produced by faster, simpler selection of (1) optimum-level production, sale and purchase of gasoline, butane, naphtha etc.; (2) severity level of the catalytic reformer; (3) tetraethyl lead content.

Because the LGP-30 is mobile, you can now have high-speed electronic computation *wherever you need it*. Operating from any convenient wall outlet, the self-cooled LGP-30 gives you memory (4096 words) and capacity comparable to computers many times its size and cost.

The lowest-priced complete computer you can buy, the LGP-30 has been so simplified that even non-technical personnel quickly grasp its operation. A library of sub-routines and programs is maintained – as well as an active users organization. Service facilities are available coast-to-coast.

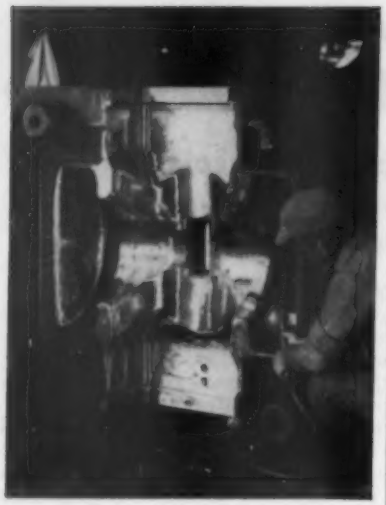
Gives you optimum level efficiency in production, sales, purchase!

Other important jobs now being assigned to the LGP-30 in numerous petroleum installations include the following: pipeline problems; mass spectrometer calculations; analysis of oil field production; flash point calculations; pumping and batching scheduling; correlation of seismic records; reservoir engineering studies; well-logging interpretations.

ROYAL McBEE

data processing division

For further information and specifications, write Royal McBee Corporation, Data Processing Division, Port Chester, N.Y.



QUALITY CONTROL AND PRESSURE CONTROL

In the picture above, a skilled Cameron die-maker is hand polishing half of a die set which will be used for forging a Cameron Type "F" Blowout Preventer body.

Why do we make our own dies for our own specially designed forging presses? Why do we make our own steel? Isn't this carrying things a bit too far? We don't think so. When a Cameron pressure control for drilling or producing leaves one of our plants we want to know that it will do everything expected of it – in Alaska, South America, Sumatra or anywhere experienced operators drill for oil. Our objective has always been pressure controls which are the finest of their kind. But the best in design requires the best in manufacture for safe, economical performance. So we leave no stone unturned. Quality control from the drafting board to the delivery dock is the reason you can COUNT ON CAMERON no matter where you drill or produce.

Cameron
IRON WORKS, Inc.
P. O. Box 1212 – Houston, Texas
Export Office: 7912 Empire State Bldg., New York City. In England: Cameron Iron Works Ltd., 76 Grosvenor St., London W. 1 England

PIPELINE CONSTRUCTION

to Regina and Moose Jaw, Sask.
Status: Proposed.

Canadian Products Pipelines

- **Foothills Products Pipe Line, Ltd.** (Pembina Pipe Line Co., Mannix Co., Ltd.), Calgary, Alta.
  Project: Gathering system to connect Alta. gasoline plants to trunk line from Alta. to Pacific Coast.
  Status: Proposed.
- **Hudson's Bay Oil & Gas Co., Ltd.**, Calgary.
  Project: 57.5-mile 6-in. line from Windfall field to Edson, Alta.
  Status: Under way.
  Contractor: **Fulton Banister, Ltd.**, Edmonton.
  Completion: July 1, 1959.
- **Hydrocarbons Pipeline Co.**, Winnipeg Man.
  Project: 800 miles of 6, 8-in. LPG line from near Edmonton to Fort William, Ont.
  Status: Has Parliament of Canada approval. Seeking approval of Federal Board of Transport Commissioners and the Alberta Petroleum and Natural Gas Conservation Board.
  Contractor: **Dutton - Williams Brothers, Ltd.**, Calgary, and **A. D. Little Co.**, Boston, are consultants.
- **Pembina Pipe Line, Ltd.**, Edmonton, Alta.
  Project: A 1,200-mile line to carry sulfur, LPG, and natural gasoline from Alta.'s gas fields to eastern Canada.
  Status: Proposed.

Canadian Natural Gas Pipelines

- **Alberta Gas Trunk Line Co., Ltd.**, Calgary.
  Project: 122 miles of 30-in. from Princess to Torrington, Alta.; 122 miles of 6 to 16-in. at various locations.
  Status: Under way.
  Contractor: **Mannix Construction Co., Ltd.**, Calgary, has 122 miles of 30-in.; **Marine Pipeline & Dredging, Ltd.**, Vancouver, has 46 miles of 30-in. from Torrington junction to Nevis, 33 miles of 16-in. from Torrington to Carstairs, and the 1,000-ft. Red Deer River crossing at Nevis.
  Completion: September 30, 1959.
  Project: 256 miles of 36-in., 75 miles of 30-in., 55 miles of 26-in., 199 miles of various diameter gathering lines, and 42 miles of 16-in. delivery lateral.
  Status: Pending approval of Canadian and U. S. regulatory agencies. To start late 1959.
- **Alberta Natural Gas Co., Ltd.** (Pacific Gas & Electric Co., San Francisco, and **Westcoast Transmission**, Calgary).
  Project: 108 miles of 36-in. across southeastern British Columbia to U. S. border near Kingsgate, B. C.
  Status: Pending approval of Canadian and U. S. regulatory agencies. To start late 1959.
- **Canadian Western Natural Gas Co., Ltd.**, Calgary.
  Project: 21.5 miles of 2-in., 59 miles of 3-in., and 12 miles of 4-in. in Alberta.
  Status: Planned.
  Contractor: Company crews.
  Completion: Oct. 1, 1959.
- **Cartier Gas Corp.** (St. Maurice Gas, Inc., and Consumers' Gas Co., Toronto).
  Project: 170 miles from Montreal to Quebec City.
  Status: Proposed.
- **Northern Natural Gas Co.**, Omaha.
  Project: 73 miles of 20-in. from Savanna Creek to Pincher Creek, Alta.
  Status: Planned.

IN CANADA

C-I-L supplies all modern commercial explosives and accessories for pipeline construction.

Specialized knowledge of Canadian conditions — terrain, rock formations, climate, etc. — is at your service when you use

EXPLOSIVES
BLASTING AGENTS AND
ACCESSORIES
MADE IN CANADA BY

C-I-L Explosives
"Everything for Blasting... Everywhere in Canada"
Canadian Industries Limited,
P.O. Box 10, Montreal

S. E. HUEY & CO.
ENGINEERS & SURVEYORS
OUACHITA BANK BLDG.
MONROE, LA.

SURVEYING & MAPPING

PIPE LINE SURVEYS

MODEL D
Sonolog
ACOUSTIC WELL SOUNDER
U. S. Patent No. 2,560,911
Trade Mark Registered

For determination of liquid level in producing oil wells, static or pumping bottomhole pressure, productivity index, pump performance, adjustments for gas lifts, etc.

Used in U.S.A., Canada, Argentina, Brazil, Colombia, Venezuela, Trinidad, Austria, Germany, Holland, Yugoslavia, Egypt, Morocco, Borneo, Indonesia, New Guinea, Saudi Arabia, France.

KEYSTONE DEVELOPMENT CORPORATION
2813 Westheimer Road Houston, Texas

INTRODUCING...

The C-R-C Model 'SPC' DOPE KETTLE

To begin its second quarter-century of service to pipeliners, C-R-C proudly introduces the new Model "SPC" dope kettle. Built with the contractor in mind, this kettle offers special improvements from top to bottom which make the "SPC" the most efficient and economical pipeline kettle in the field. Outstanding among its many features are:

- **Sweep and propeller agitation** for more uniform heating and mixing.
- **Cerafelt® fiber insulation,** holds heat in kettle, requires less heating time.
- **Side stacks** which increase the heating surface area to 95 square feet.
- **A pressurized fuel tank,** to operate without costly fuel pumps.
- **Improved low pressure diesel or kerosene burner** with increased heating efficiency.
- **Hydraulic system** simplified for easy operation and less field maintenance.

The "SPC" is built with a heavy duty frame and has thicker bottom plating for longer life. A new tongue design strengthens the front end. Ten to 30 barrel sizes can be built and mounted on tracks or skids, or fitted for stationary jobs.
Air or water-cooled engine optional.

We're waiting for your call to tell you more about the C-R-C Model "SPC" dope kettle.

"SERVING PIPELINERS SINCE 1933"

CRUTCHER · ROLFS · CUMMINGS, INC.

Home Office: Houston, Texas, Box 2073, UNderwood 4-6391

Branch Office: Farmington, N. M., Box 1207, DAvis 3-5523
Export Office: International Oil Equipment Co., 30 Rockefeller Plaza, New York, N. Y., COlumbus 5-6250
In Canada: Canadian Equipment Sales & Service Co., Ltd., 7310 99th St., Edmonton, Alberta, Canada

The Image of CF&I *assures top quality in*

SEAMLESS
CASING AND TUBING

The CF&I giant stands for skill and long years of experience in producing quality steel products. And in the petroleum industry, users have learned to rely on CF&I's craftsmanship for straight, strong and "true" seamless casing and tubing.

CF&I's advanced production equipment and techniques—from special heat treatment to precision threading, plus a system of meticulous inspections—is your guarantee of quality casing and tubing. Made from top quality steel, CF&I Seamless Casing and Tubing are subjected to rigid manufacturing standards and meet API STD 5A specifications. They are available in sizes 2⅛" through 9⅝" O.D.

The next time you need seamless tubing or casing, we suggest that you get in touch with us. We'll be happy to quote on your requirements. 6622

CF&I STEEL **SEAMLESS** *casing and tubing* API

THE COLORADO FUEL AND IRON CORPORATION
DENVER, COLORADO

makes Thermoid Powerflex the strongest, safest rotary hose in the industry

Why does Thermoid Powerflex have 40% more bursting strength than the second-best rotary hose?

It's because of the exclusive "cable-lock" coupling shown above, which is integral with every hose length. Note how each of the steel reinforcing cables is accurately positioned to insure equal cable stress. This exclusive construction feature gives up to thousands of extra pounds of evenly balanced holding power from coupling to coupling.

Thermoid Powerflex Hose not only can operate safely at any pump pressure now available, but has a reserve strength that insures against blow-outs, thus guaranteeing uninterrupted service during its long life.

Every length in every size (up to 4" inside diameter) certified API Class C. Ask the Thermoid distributor for full information, or write *Thermoid Division, H. K. Porter Company, Inc., Tacony & Comly Sts., Philadelphia 24, Pa.*

THERMOID PORTER DIVISION

H.K. PORTER COMPANY, INC.

PORTER SERVES INDUSTRY: with Rubber and Friction Products—THERMOID DIVISION; Electrical Equipment—DELTA-STAR ELECTRIC DIVISION, NATIONAL ELECTRIC DIVISION; Copper and Alloys—RIVERSIDE-ALLOY METAL DIVISION; Refractories—REFRACTORIES DIVISION; Electric Furnace Steel—CONNORS STEEL DIVISION, VULCAN-KIDD STEEL DIVISION; Fabricated Products—DISSTON DIVISION, FORGE AND FITTINGS DIVISION, LESCHEN WIRE ROPE DIVISION, MOULDINGS DIVISION; and in Canada, Refractories, "Disston" Tools, "Federal" Wires and Cables, "Nepcoduct" Systems—H. K. PORTER COMPANY (CANADA) LTD.

PIPELINE CONSTRUCTION

Project: 32 miles of 24-in. from Pincher Creek to Mont. border to tie in with planned U. S. line on to Minneapolis.
Status: Planned.

- **Saskatchewan Power Corp.,** Regina, Sask.

Project: 52.5 miles of 6-in. and 24 miles of 4-in. from St. Louis to Tisdale, Sask.
Project: 79 miles of 10-in. from Success to Rosetown.
Project: 113 miles of 8-in. from Regina to Yorktown.
Contractors: **Marine Pipeline & Dredging, Ltd.,** Vancouver, has the 4, 6, and 8-in., and **Dutton-Williams Brothers, Ltd.,** Calgary, has the 10-in.
Completion: Sept. 15, 1959.

- **Trans-Canada Pipe Lines, Ltd.,** Toronto.

Project: 500 miles of main-line loops.
Status: Planned.
Completion: Late 1962.

- **Van Tor Oil & Exploration Co.,** Vancouver, B. C.

Project: Line from B. C. mainland to Vancouver Island.
Status: Proposed.
Completion: 1960.

- **Westcoast Transmission Co., Ltd.,** Calgary.

Project: (See Alberta Natural Gas Co., Ltd., for joint project).

Foreign Crude Oil Pipelines

- **Arab Pipeline.**

Project: 1,250-mile 40-in. pipeline from the Persian Gulf to Mediterranean serving fields in Saudi Arabia, Kuwait, Iran, and Iraq.
Status: Proposed by Saudi Arabian Government as project of Arab countries.

- **Arabian American Oil Co.,** Dhahran, Saudi Arabia and N.Y.C.

Project: 63 miles of 30, 32-in. from Khursaniyah to Ras Tanura.
Status: Planned.
Contractor: Company personnel.
Completion: January 1, 1960.
Project: 18 miles of 34, 36-in. from Qatif to Ras Tanura.
Status: Planned.
Contractor: Company personnel.
Completion: July 1, 1962.
Project: 6 miles of 30-in. from Ras Tanura to Ras Tanura terminal; 4 miles of 14-in. from Buqqa to QA-2 pipeline.
Status: Planned.
Contractor: Company personnel.
Completion: October 1, 1960.

- **Assam Oil Co.,** Digboi, Lakhimpur District, Assam, India.

Project: 600 miles of 20-in. from Nahorkatiya field in Upper Assam to Barauni, India, to connect with Burmah Oil Co.'s proposed 250-mile line from Barauni to Calcutta.
Status: Planned.

- **Basrah Petroleum Co.**

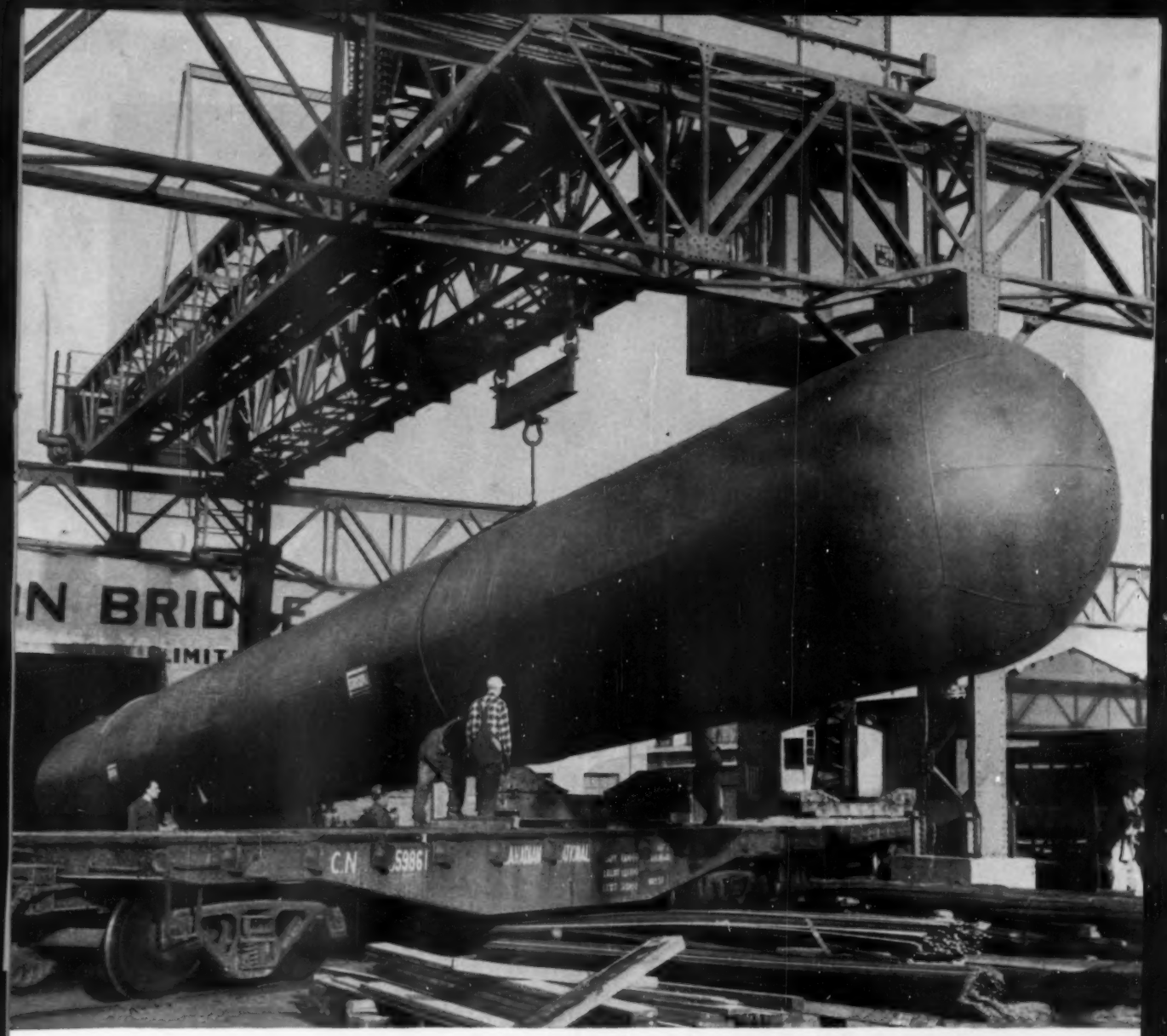
Project: 70 miles of 30 and 32-in from Zubair to Fao, Iraq.
Status: Planned.
Completion: 1961.
Project: Two 32-in. submarine lines from Fao, Iraq, to island 24.3 miles out in Persian Gulf.
Status: Under way.
Contractor: **Collins Submarine Pipelines Overseas, Ltd.,** Port Lavaca, Tex.
Completion: Summer 1959.

- **Bolivia-Paraguay.**

Project: 500 miles of 6-in. from Southeast Bolivia to a proposed refinery on Paraguay River, and later to Asuncion.
Status: Planned.

- **British Petroleum, Ltd.**

Project: 60 miles of 18-in. across South



No Guided Missile...

... this butane storage tank was skilfully guided from blueprint stage through manufacturing, thence by special train to a western oil refinery.

120 ft. long, 10 ft. in diameter and weighing 45 tons with a capacity of 67,200 gallons at 90 lbs. psi—this product of our Calgary branch is one of the largest tanks of its kind ever made in Canada —two more are on order.

We are ready to solve *your* platework problems ... large or small.

PLATEWORK BY

DOMINION BRIDGE

DOMINION BRIDGE COMPANY, LIMITED

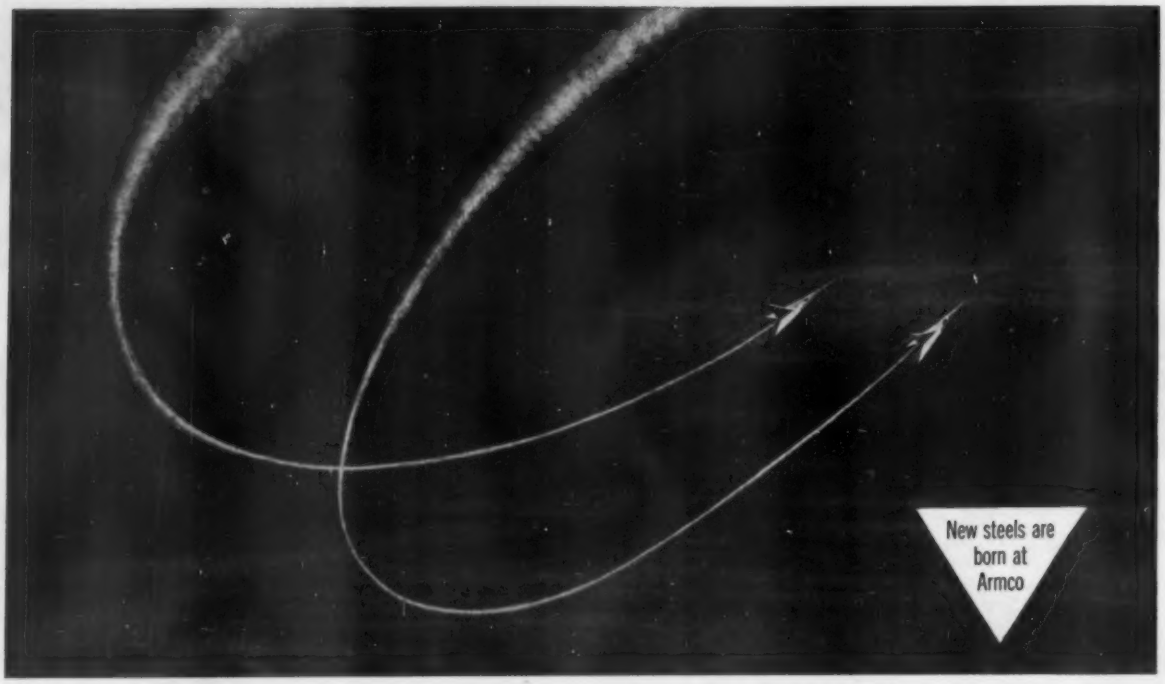
Plants: MONTREAL • OTTAWA • TORONTO • SAULT STE. MARIE • WINNIPEG • CALGARY • EDMONTON • VANCOUVER

Assoc. Company Plants:
AMHERST, N. S.:
Robb Engineering Wks. Ltd.

QUEBEC:
Eastern Canada Steel & Iron Wks. Ltd.

WINNIPEG:
Manitoba Bridge & Eng. Wks. Ltd.

Divisions:
Platework • Structural
Mechanical • Boiler
Warehouse.



Pounds saved with alloy steels can be worth their weight in gold

Planes, like people, sometimes have a lot to gain by losing weight.

Example: excess weight in aircraft costs around $500 a pound (in terms of maintaining strength and economical operation). That's just about the going price of gold.

Among other desired properties, Sheffield Alloy Steels provide high strength-to-weight ratios. In highest tensile-strength brackets, these steels are actually lighter for the load they carry than any other commonly used metal.

Sheffield combines alloying elements with steel under precisely controlled conditions of time, temperature and atmosphere. Result: alloy steels with the right combination of weight, strength, hardness, ductility and machinability for just about any need. From drill bits boring five miles down to components of rockets that reach for the moon.

If you're a manufacturer using steel, you'll find the metal you want in the Sheffield alloys. Sheffield's recently expanded heat-treating facilities and nearby locations give you buying advantages, and possible production economies, worth learning about. Get in touch with us.

SHEFFIELD

Heat-Treated Carbon and Alloy Steels

SHEFFIELD DIVISION

ARMCO STEEL CORPORATION

OTHER DIVISIONS AND SUBSIDIARIES: Armco Division • The National Supply Company • Armco Drainage & Metal Products, Inc. • The Armco International Corporation • Union Wire Rope Corporation • Southwest Steel Products

PIPELINE CONSTRUCTION

Wales, from Milford Haven to the Llandarcy refinery.

Status: Under way.

Completion: Late 1959.

• **Burmah Oil Co., Ltd.,** Glasgow, Scotland.

Project: 250 miles of 20-in. from Barauni to Calcutta, India, extending Assam Oil Co.'s proposed line.

Status: Survey under way.

• **C.R.E.P.S., Societe Nationale de Recherche et d'Exploration des Petroles en Algerie (SN Repal)** and **Cie. Francaise des Petroles Algerie,** Paris, France.

Project: 470 miles of 24-in. from Edjele fields in southeastern Algeria to the Tunisian Mediterranean coast.

Status: Preliminary work under way.

Contractor: **TRAPSA** (transportation subsidiary of CREPS), with technical assistance and supervision of the project by **Bechtel Mediterranean** (subsidiary of Bechtel Corp., San Francisco).

Completion: September 1960.

• **Elburz Oil Corp.**

Project: 1,000 miles of 38-in. to move Qum crude to the Mediterranean.

Status: Planned.

• **ENI (Italian state oil agency)** and **Italo-Swiss Finance Co.**

Project: 250-miles of 24-in. and smaller diameters from Genoa to Aigle, Switzerland.

Status: Planned.

Completion: 1961.

• **Iranian Oil Exploration & Producing Co.**

Project: 26 miles of 30-in. from Ganaweh, Iran, to Kharg Island.

Status: Under way.

Contractor: **International Marine Constructors, C. A.,** Port Lavaca, Tex.

Completion: Summer 1959.

• **Iranian Oil Participants, Ltd.**

Project: 30 miles of 20-in. and 22 miles of 16-in. looping of Agha Jari to Bandar Mashur line.

Status: Planned.

Project: 50 miles of 26, 28-in. from Gach Saran field to new terminal at Kharg Island in the Persian Gulf.

Status: Under way.

Contractor: A joint venture of **Raymond Concrete Pile Co.** and **Williams Bros. Co., Tulsa, Richard Costain, Ltd.,** and **John Brown, Ltd.,** London, and **Werkspoor & Bredoro,** The Netherlands.

• **Iraq Petroleum Co.,** London.

Project: 30/32-in. loops as follows: 27 miles west of T.2 station, 42 miles between T.2 and T.3, and 40 miles between Homs and Banias, Syria.

Status: Under way.

Completion: 1959.

• **Israel Government**

Project: 16-in. loop of 8-in. line on 235-mile Gulf of Aqaba-Haifa system.

Status: Proposed.

Project: Replace 125 miles of 8-in. from Elath to Beersheba with 16-in.

Status: Planned.

• **Kuwait Oil Co., Ltd.,** London.

Project: 61 miles of 30-in. from Raudhatain area to Ahmadi.

Status: Under way.

Completion: June 1959.

Project: 5 miles No. 11 and 5 miles No. 12 gravity line from Ahmadi North Tank Farm to North Pier; 4 miles of 34-in. from Ahmadi South to Ahmadi North Tank Farm; 6 miles of 38-in. loading lines on North Pier.

Status: Under way.

Completion: First quarter 1959.

• **Mene Grande Oil Co.,** Caracas, Venezuela.

Project: 24 miles of 16-in. from Zarza to Zulus; 12 miles of 24-in. from West Guara to Oficina; 5 miles of 24-in. near Melones.

Status: Planned.

Completion: 1959.

• **Middle East Pipeline.**

Project: 1,500 miles of 38, 40-in. from Persian Gulf to Mediterranean at Iskenderun, Turkey.

• **Petroleo Brasileiro S. A. (Brazil).**

Project: 40 miles of 12-in. from Catu to Madre de Deus in Bahia.

Status: Under way.

Contractor: **Techint, Inc.**

Project: 80 miles of 24-in. to tie in to proposed Caxias refinery near Rio de Janeiro.

Status: Planned.

• **Rotterdam-Rhine Pipeline Co.** (Caltex Petroleum Maatschappij, Bataafsche Petroleum Maatschappij, Gelsenberg Benzin A. G., and Moiloil A. G.)

Project: 59 miles of 30-in. and 96 miles of 24-in. from Rotterdam to Ruhr industrial area in West Germany to supply refineries at Godorf and Wesseling, and a 25-mile branch to Wessel to serve the refinery in Gelsenkuchen.

Status: Under way.

Contractor: **Bechtel International Co.,** is project manager. **Associated Pipe Line Contractors** has most of construction. German and Dutch firms have 33 miles of 24-in. in south Holland and four major submarine crossings.

Completion: Mid-1960.

• **Royal Dutch-Shell.**

Project: 700-mile line across Europe from the Mediterranean to the North Sea, running through eastern France, Luxembourg, West Germany, Netherlands, and Belgium. Main line to be 30-in.

Status: Considering project as joint venture with several other companies.

Project: 161 miles 20-in. line from Tandzung field to Balikpapan refinery, Borneo.

Status: Planned.

Contractor: **Williams Brothers Overseas, Ltd.,** Tulsa, and **John Brown, Ltd.,** London.

H-O-H*

GLUCOSATES*

Improved Through Research
Proven By Performance
The Best For Your
Water Treating Problems

WE READ WATER H-O-H ESTABLISHED 1931

Write for literature on your letterhead.

*REG. U.S. PAT. OFF.

D. W. HAERING & CO., INC.
ANALYSTS · CONSULTANTS · MANUFACTURERS
P. O. Box 10337
San Antonio 21, Texas

PIPELINE CONSTRUCTION

Completion: January 1, 1962.

- **SOPEG** (construction organization for Cie. Francaise des Petrole (Algerie) and Ste. Nationale de Recherche et d'Exploitation des Petroles en Algerie).

Project: 412 miles of 24-in. from Hassi Messaoud field in the Algerian Desert to Bougie on the Mediterranean Coast.

Status: Under way.

Contractor: **Entrepose Co.** and **Ste. Parisienne pour Industrie Electrique** have 281 miles. **SOCOMAN** and **Eau Assainissement** have 131 miles.

Completion: Late 1959.

- **South European Pipeline Co.** (Jersey Standard, Caltex, and 17 European firms).

Project: 419 mile 30-in. line from Lavera, near Marseille, to Strasbourg, with 40-mile extension to Karlsruhe, Germany.

Status: Proposed.

- **Superior Oil Co.,** Los Angeles.

Project: A 16 and 24-in. line from its Lake Maracaibo, Venezuela, production to shore.

Status: Planned.

Contractor: **Pipe Line Technologists, C.A.,** Maracaibo, has design.

- **Syrian Pipeline,** Damascus.

Project: 500-mile line from Karshuk field, Syria, to Mediterranean.

Status: Proposed.

- **Union of Soviet Socialist Republic.**

Project: 2,315 miles of 28-in. Trans-Siberian crude-products line from Ufa Tuimaza fields in Bashkiria to Irkutsk near Lake Baikal.

Status: Under way.

Project: 600-mile line from Russian fields to Czechoslovakia.

Status: Planned for 1960.

Project: Line from Russian fields to East Germany, possibly as part of a petrochemical expansion program.

Status: Planned.

- **Venezuelan Sun Oil Co.**

Project: 18-in. crude line from Block 1, Lake Maracaibo, to Punta Palmas terminal.

Status: Under way.

Contractor: **J. Ray McDermott & Co.**

Completion: Summer 1959.

- **Yacimientos Petroliferos Fiscales (Argentina),** Buenos Aires.

Project: 815 miles of 12-in. from Campo Duran to San Lorenzo.

Status: Under way.

Contractor: **SARGO** (Fish Engineering Corp., Fish Northwest Constructors, Inc., Clark Brothers, North American Utility, Construction International Co.).

Contractor: **Techint, Inc.,** has subcontract for 600 miles of 12-in.

Status: Under way.

Completion: Mid-1960.

Project: 390 miles of 14-in. from fields in Neuquen Province, Argentina, to Bahia Blanca on the coast.

Status: Bids requested.

Project: 625 miles of 12-in. from Mendoza to San Lorenzo.

Status: Planned.

Foreign Products Pipelines

- **Kuwait Oil Co., Ltd.,** London.

Project: 12 miles of 16, 20, 24-in. on Ahmadi North Pier.

Status: Under way.

Completion: First quarter 1959.

- **National Iranian Oil Co.,** Azna, Iran.

Project: 200 miles of 6 and 8-in. extension of the Trans-Iranian line from Teheran northward to Resht on the Caspian Sea.

Status: Under way.

Contractor: **B. & M. Construction Co.,** Oklahoma City; **Cheney Construction Co.,** Seattle; **Merritt-Chapman & Scott,** New York City.

Completion: April 1959.

- **North Atlantic Treaty Organization** (Bid details from Bureau of Foreign Commerce, U. S. Department of Commerce, Washington).

Project: 57 miles of 8-in. in Germany to Land Baden-Wuerttemberg air field.

Status: Planned.

- **Petroleos Mexicanos**

Project: Line from Mexico City to Toluca.

Status: Planned.

Project: Line from Mexico City to Cuernavaca.

Status: Planned.

Project: Line from Monterrey to Torreon.

Status: Planned.

- **Pipelines of Puerto Rico,** San Juan.

Project: 95 mile 8-in. line from Commonwealth Oil refinery at Penuelas to Catano in the vicinity of San Juan.

Status: Approved by Puerto Rican Public Service Commission.

- **Union of Soviet Socialist Republic.**

Project: 2,315 miles of 28-in. Trans-Siberian crude-products line from Ufa Tuimaza fields in Bashkiria to Irkutsk near Lake Baikal.

Status: Under way.

- **Yacimientos Petroliferos Fiscales (Argentina),** Buenos Aires.

Project: 652 miles of 10-in. from Lujan de Cuyo to Buenos Aires.

Status: Planned.

Foreign Natural Gas Pipelines

- **Attock Oil Co., Ltd.,** London.

Project: 60 miles of line from Dhulian field to Rawalpindi in West Pakistan.

Status: Planned.

- **Creole Petroleum Corp.,** Caracas.

Project: 17 miles of 30-in., 1.8 miles of 24-in., 1.7 miles of 20-in., and 1.6 miles of 16-in. from Lake Maracaibo flow stations to Conservation plant Bachaquero 1; 22 miles of 12-in. from Bachaquero 1 to Conservation plant Tia Juana 2.

Status: Planned.

Completion: June 1, 1960.

- **Cuban Gas Transmission Co.**

Project: 500-mile line from Campeche area of Mexico across Yucatan and a 150-mile line on the ocean floor to Havana.

Status: Under study by **Ebasco Services.**

- **French Government,** Paris.

Project: 400-mile big-inch gas line from Hassi R'Mel field to power plant at Bone, Algeria.

Status: Proposed.

- **Gaz de France.**

Project: 550 miles of 16 to 24-in. from Lacq field in southwestern France to Paris, plus 12 to 16-in. laterals to Lyons, making a 1,000-mile system.

Status: Under way.

Contractor: French contractors.

Completion: Line to Lyons to be completed March 1959; line to Paris in 1960.

- **Japan Gas Chemical Industries.**

Project: 10 miles of 10-in. from its company-owned fields to plants in Niigata, Japan.

Status: Under way.

Completion: Spring 1959.

- **Mene Grande Oil Co.,** Caracas, Venezuela.

Project: 20 miles of 12-in. from Soto to Mata.

Status: Planned.

Completion: 1959.

- **Petroleos Mexicanos,** Mexico D. F.

Project: 130 miles of 22-in. to parallel a 14-in. line from Reynosa to Monterrey.

Project: 490 miles of 24-in. from Jose Colomo field in the State of Tabasco to Mexico City.

Status: Preliminary work under way.

Completion: March 1960.

Project: Line from Pemex City to Irapuato.

Status: Planned.

Completion: 1960.

Project: Line from Monterrey to Torreon.

Status: Planned.

Completion: 1960.

- **Sui Gas Transmission Co.,** Multan, Punjab, India.

Project: 130-mile extension of the new 310-mile, 16-in. Multan-to-Sui, Pakistan line. Extension will terminate at Lyallpur.

Status: Planned.

- **Union of Soviet Socialist Republic.**

Project: A 465-mile line from Karadag near Baku to Tbilisi and Erevan.

Status: Under way.

Completion: 1960.

Project: A 127-mile line across the Turkmenian Desert from Kizyl-Kum to the Caspian Sea port of Krasnovodsk.

Status: Under way.

Project: Two parallel lines, each over 1,200 miles long, from Gazly, near Bukhara, northward to Sverdlovsk and Chelyabinsk.

Status: Proposed.

Project: Line from near Bukhara, through Tashkent to Chimkent, Dzhambul, Frunze, and Alma-Ata near the border.

Status: Proposed.

Project: Line from Sverdlovsk to Omsk, Kemerovo and Tomsk.

Status: Proposed.

Project: Line from Berezovo field to Sverdlovsk.

Status: Proposed.

Project: Line from Stalingrad to Gorky and to Moscow.

Status: Proposed.

Project: Line from Dzhebol field to Izhevsk and to Sverdlovsk.

Status: Proposed.

Project: Line from Gorky to Kazan.

Status: Under way.

Project: Line from Saratov to Sverdlovsk, with branches into Stepanovskoe field.

Status: Proposed.

Project: Line from Kanevskoe (Kransnodar) field to Sulkhumi.

Status: Proposed.

Project: Line from Shebelinka field to Rostov, to Odessa, and northward to connect with proposed line from Lvov to Leningrad.

Status: Proposed.

Project: Line from Riga to proposed line from Lvov to Leningrad.

Status: Proposed.

Project: Line from Rostov to Moscow.

Status: Proposed.

Project: Line from Severo-Stavropolskoe (North Stavopol) field to Moscow.

Status: Under way.

Project: Line from Leningrad to Moscow.

Status: Under way.

- **Yacimientos Petroliferos Fiscales (Argentina),** Buenos Aires.

Project: 1,015 miles of 24-in. from Camp Duran to Buenos Aires.

Status: Under way.

Contractor: **SARGO** (Fish Engineering Corp., Fish Northwest Constructors, Inc., Clark Brothers, North American Utility, Construction International Co.), subcontracted to COGAR (River Construction Corp., Ft. Worth, Tex.), Milton Brazier, supt. for 700 miles from Buenos Aires to Tucuman, office at Buenos Aires; E. L. "Tex" Maggard, supt. for 400 miles from Campo Duran to Tucuman.

Completion: August 1960.

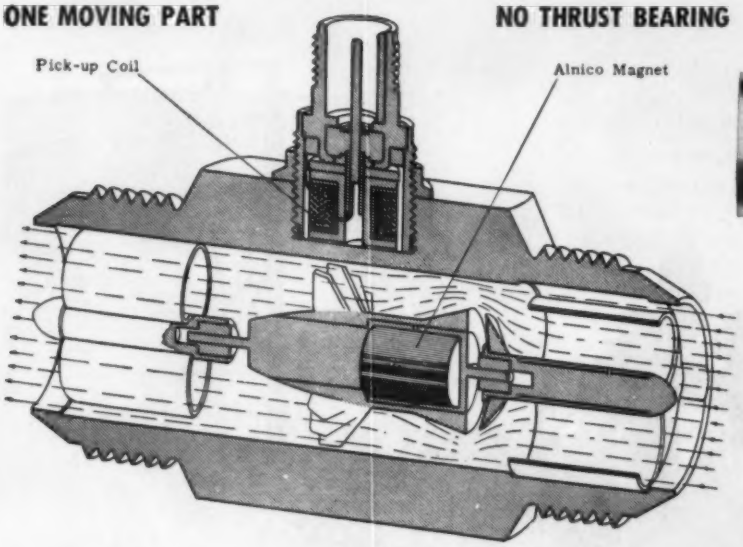
Project: Line from Comodoro Rivadavia to Buenos Aires with a spur to Plaza Huincul field in Neuquen province. Line will be 26-in. to the connecting point for the Plaza Huincul link and 30-in. from the connection to Buenos Aires.

FACTS ABOUT pottermeter BOWSER

PETROLEUM PRODUCT METERS

POTTERMETER . . . electronic-sensing turbine type

ONE MOVING PART **NO THRUST BEARING**

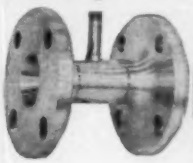


Pottermeter produces an electric signal whose frequency is accurately proportional to the rate of flow of a liquid through a pipe section. Suitable instrumentation measures this signal to indicate or record the flow, or operate any controls required in a liquid handling operation.

ONLY ONE MOVING PART!

PIPELINE MOUNTING

⅛" TO 18" OR LARGER FOR ANY LIQUID TRANSFER JOB



ACCURATE

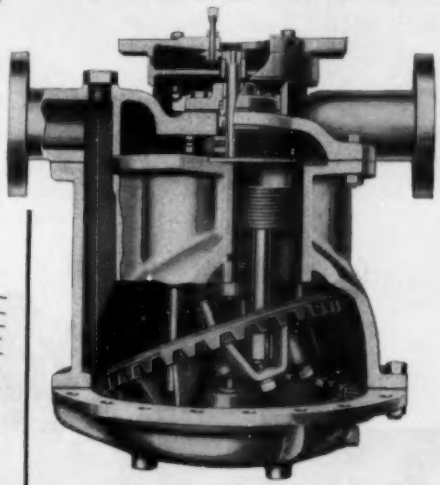
OIL or GAS

EASY TO INSTALL

AVAILABILITIES

FLOW RANGES	to 40,000 g.p.m. or more
OPERATING PRESSURES	unlimited
TEMPERATURE RANGES	−455°F. to +1500°F.
PRESSURE DROP	virtually nil
CONNECTIONS	no limitation
CONSTRUCTION (standard)	Type 316 stainless steel

BOWSER XACTO
positive piston displacement



Xacto Meters utilizes positive displacement pistons linked with a drive shaft to mechanically operate any one of many types of counters, or to transmit pulses for recording devices or for remote control of the metered liquid.

PROPORTIONING BLENDERS (LUBE OILS)

Xacto Meter equipped. Blend two or more liquids in closed system, continuous production. Also rate of flow controllers to maintain constant control of flow rate automatically.

AVAILABILITIES

FLOW RANGES	6 g.p.h. to 250 g.p.m.
OPERATING PRESSURES	to 500 p.s.i.
TEMP. RANGES	−40°F. to +225°F.
PRESSURE DROP	moderate
CONNECTIONS	to catalog standards

SALES AND SERVICE OFFICES IN PRINCIPAL CITIES

•

WORLD'S MOST COMPLETE METER LINE

INDICATING, RECORDING AND CONTROL AVAILABILITIES

INDICATING devices permit reading at meter or remote locations.

•

RECORDING devices provide file data for permanent records.

•

CONTROL devices enable liquid process automation for batching, blending, packaging, etc.

Both Xacto Meters and Pottermeters provide the basis for improved liquid control systems. New readout devices, both mechanical and electronic, adapt to these meters. A Pottermeter-Bowser sales engineer will gladly confer on your metering requirements at your request.

WRITE FOR CATALOG DATA FOLDERS

•

SPECIFY LIQUID TO BE METERED

POTTER-BOWSER DIVISION...BOWSER, INC.

MARKETING DIVISION
FORT WAYNE, INDIANA

Oil and farming combine to make the Kansas countryside an imposing sight. In this area, formations like the Arbuckle and Kansas City Lansing are usually treated with Dowell inhibited acid.

MAKE YOUR WELLS WORTH MORE

Insist On Dowell When You

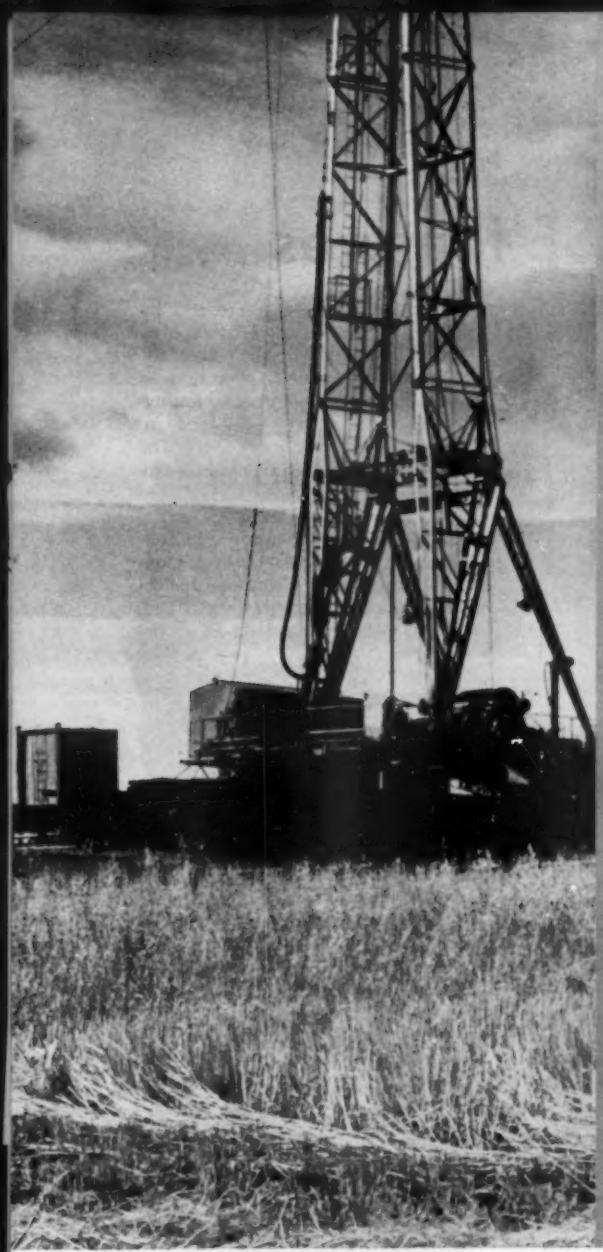
For many well conditions, "regular" inhibited hydrochloric acid gives excellent results. In these wells, addition agents or other auxiliary treating materials are not needed. This means that an operator can get a given size treatment for less money. It can mean a quicker payout and more profitable production.

But regular acidizing is not always as simple as it may seem. If addition agents *are* needed and are not used, silicate swelling or emulsions, for example, can actually reduce production. In such cases, remedial work may be required.

To avoid costly treatment failures, many operators use Dowell experience and facilities—on even the "simplest" acidizing jobs. There are many reasons to insist on Dowell:

First, Dowell has had *more* experience than any other company. There are few fields in the United States, Canada, and Venezuela in which Dowell has not had acidizing experience. In some cases, Dowell has acidized old wells three and four times. To you, this simply means that you have a better chance for success when you insist on Dowell.

Second, Dowell engineers are well-trained and familiar with their area. They use this training and knowledge to help assure the success of your treatment. Their record contains a relatively high percentage of successes.



Here Are Some Conditions Where Dowell "Regular" Acid Treatments May Be Your Best Stimulation Buy

If you are re-treating an old well—

—usually the basic drainage channels already exist and only need to be cleaned up and extended. Large treatments using Dowell regular acid have been quite successful in re-treating old wells in many fields.

If your crude does not emulsify easily—

—if both formation characteristics and produced fluid tests indicate no emulsion or other special problems, you may save money or get a bigger treatment using Dowell inhibited acid without other additives.

If your formation is a medium-reacting limestone—

—often, regular acid will provide just the right rate of reaction when it is skillfully injected. Your Dowell engineer can help you decide whether addition agents are needed. In any case, he can help you design a low-cost acid treatment especially for your well.

If you have plastic-coated tubing—

—the chances are you have overcome your iron scale problem. If this is the case, inhibited acid without additives may do the job.

If your problem is not clear—

—or just to be sure, call the Dowell engineer for help. Rely on his knowledge of local conditions and Dowell's experience in well stimulation. Let him turn his expert attention to your problem.

Treat With "Regular" Acid

Third, if the Dowell study of your well problem indicates that addition agents are needed, you will get not only the best additives but the widest variety. Dowell pioneered the development of special acids to combat such problems as silicate swelling, emulsions, iron precipitation, mud contamination, and too-fast reaction rate.

Fourth, you save money with safety when you insist on Dowell.

The success of any stimulation treatment depends on both well improvement and treatment cost. Your Dowell engineer can help you tailor *low-cost* acid jobs to fit your needs.

The examples in the box above show several conditions where regular acidizing has provided satisfactory treatment.

For prompt service or detailed information on acidizing or any of the other Dowell well stimulation services, call the Dowell office nearest you. In Canada, contact Dowell of Canada, Ltd.; in Venezuela, United Oilwell Service. Dowell, Tulsa 1, Oklahoma.

Services for the oil industry

DOWELL

DIVISION OF THE DOW CHEMICAL COMPANY

▶ ▶ ▶ New Equipment Section

This week's SHOWCASE features . . .

Five-lb. ultrasonic thickness tester

. . . has been developed for nondestructive thickness measurements from one side of most metals, glass, ceramics, and plastics. The 5-lb. weight of the instrument includes the batteries, probe, harness, cable, and earphones.

Since the gage is so lightweight and compact it can be handy for field inspection of a variety of equipment. This includes pipe, tanks, pressure vessels, and other equipment where corrosion is suspected.

Basically it operates like this: When the high-sensitivity ceramic transducer is applied to one surface of the material under test, the instrument indicates harmonic resonances by audible signal in the headphones and by deflection of a small indicator. Simultaneous computation and conversion of these resonance frequencies to thickness is registered on a panel meter.

One advantage of the instrument is that it is direct reading. By setting a selector switch to one of three positions, the operator can determine the thickness of steel, aluminum, or copper automatically, without conversion charts or separate calculations. A fourth position permits calibration for other materials.

The instrument is simple to operate. Inexperienced personnel can use it effectively after only a short training period.

Dimensions of the gage are: 9¾ by 4⅜ by 4½ in. Three radio type of mercury batteries furnish power for 70 hours of continuous operation or about 2 to 4 months of normal testing.

Instrument range is 0.09 to 5 in. Accuracy is within 3 to 5%. The Model 6 Audigage can be used on any flat, cylindrical, or compound-curved surface with a 1-in. radius or more. Other transducer mountings are optional for smaller pipe or tubing. **Contact Manufacturer: Branson Instruments, Inc., 40 Brown House Road, Stamford Conn., for details on Model 6 Audigage.**

●

Water-cooled total-pressure probe

. . . has been developed to provide any number of measuring points to take velocity and thrust measurements in high-velocity flames, such as in burners. A companion probe has been developed for measuring the velocity and flow directions in liquids or gases in such applications as pumps and turbines. The velocity probe is cylindrical and comes in sizes as small as ⅛ in. **Contact Manufacturer: United Sensor & Control Corp., Box 127, Glastonbury, Conn., for details on pressure and velocity probes.**

●

Automatic control for pump engines

. . . in pipeline or production use just released operates from the pipeline or well-pump engine battery. So, no commercial power is needed for operation.

The program-timer control can be used on gas, gasoline, or diesel engines. It comes encased in a steel weatherproof enclosure. Engines equipped with the Syncro-Start con-

Send this **Showcase Coupon**

to the Manufacturer of the item in which you are interested. See name, address, and equipment name and/or model, in bold-face type at end of description.

NAME AND/OR MODEL NUMBER.....

.....

Described in OIL AND GAS **JOURNAL** - Issue of **May 25, 1959**

NAME.....TITLE.....

COMPANY.....

ADDRESS.....

CITY.....STATE.....

• Cuts cleanly with minimum flare.
• No damage to surrounding casing.
• Operates at pressures up to 10,000 psi.
• Operates at temperature of 300 degrees F.

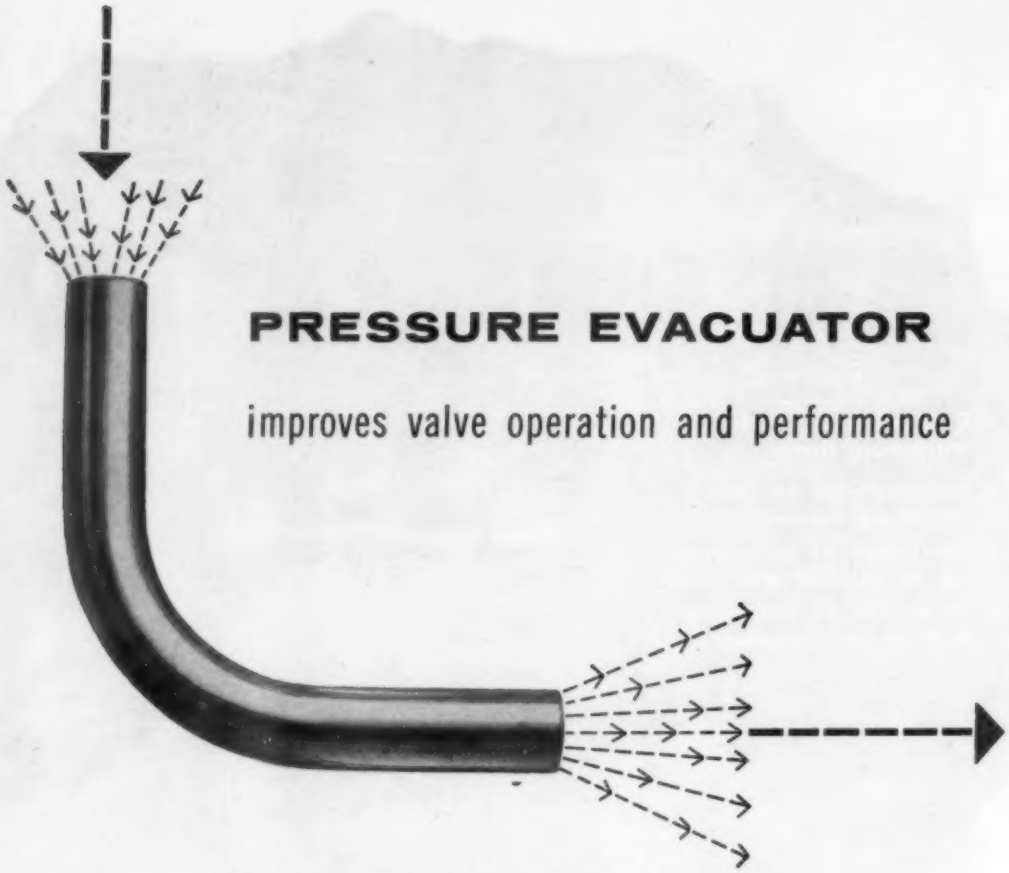
Jet Tubing Cutter

Designed to answer the need for a dependable tool for removing bull plugs, tubing stops or other obstructions from the end of tubing strings, the Welex Jet Tubing Cutter cuts cleanly without damage to surrounding casing. Ideal for oil field salvage work and cutting stuck tubing, the Welex Jet Tubing Cutter is another service of the complete wireline service company.

ORIGINATORS OF Welex JET PERFORATING

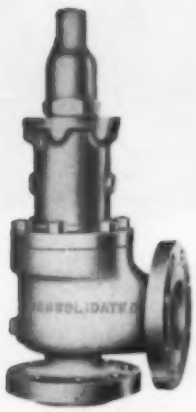
WELEX, INC.

General Offices: 1400 East Berry, Fort Worth, Texas
Division offices in Denver, Houston, Los Angeles, Midland, New Orleans, Tulsa and Wichita.
District offices in every major oil center. Subsidiaries in Canada, Peru and Venezuela.



PRESSURE EVACUATOR

improves valve operation and performance



Consolidated Safety Relief Valve, Type 1900 Series, Sizes: 1" x 2" to 8" x 10".

The Eductor Tube in Standard Consolidated Safety Relief Valves is a pressure evacuator. It efficiently removes pressure from the closed bonnet. If allowed to remain in the bonnet, the pressure would act on the top of the disc and tend to limit the lift and induce cycling. But with the pressure evacuated from the closed bonnet through the Eductor Tube, the spring alone controls valve action. Consequently, *reliable* valve action and guaranteed capacity ratings are attained. A new high in operational dependability is assured.

Reliable operation and performance of Consolidated Safety Relief Valves are your assurance of absolute protection for personnel and equipment. "2 in 1" design permits you to convert the Standard valve to the Bellows type in your own shop. But that is only part of the total economy of these modern valves. Get the complete inside story. Write for Catalog 1900.

MANNING MAXWELL & MOORE INC. M&M TRADE MARK

CONSOLIDATED SAFETY RELIEF VALVES

A product of

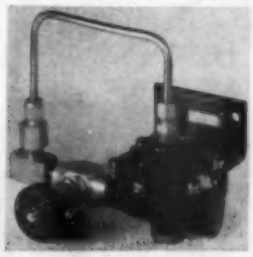
MANNING, MAXWELL & MOORE, INC.

Consolidated Ashcroft Hancock Division • Tulsa, Oklahoma

In Canada: Manning, Maxwell & Moore of Canada, Ltd., Galt, Ontario

trol can be preset for the length of time, time of day or night, and the days of the week the engine is required to run as well as the time the engine is to be stopped. **Contact Manufacturer: Syncro-Start Products, Inc., 8151 North Ridgeway Avenue, Skokie, Ill., for details on automatic pump-engine control.**

●



Flow-rate controller

. . . regulates flows as low as 2 cc. a minute. Air flows as low as 30 c.f.m. can also be kept constant with the controller. The Model 63L controller promises to be particularly suitable for very small process or sampling streams. It is used with external needle valves or other adjustable restrictions.

Applications include gas chromatographs where it can be used to regulate the small flow of the helium stream carrying the process sample. Purge systems, pilot plants, and process blending are other possible uses. **Contact Manufacturer: Moore Products Co., H and Lycoming Streets, Philadelphia 24, for details on Model 63L controller.**

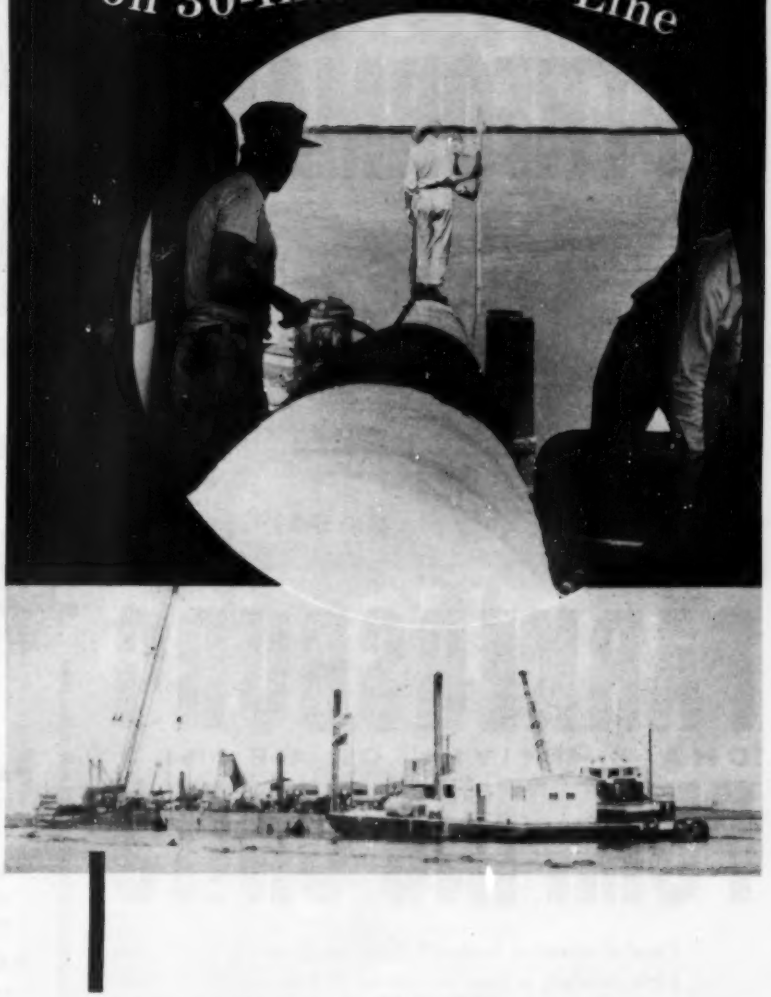
●

Turbine flowmeter is redesigned

. . . to be smaller and lighter than older models of the Cox Type 20 meter. The meter measures liquid flow with a ½% accuracy at pressures up to 5,000 psi. and at temperatures from —455° up to 1,000° F., viscosity permitting. Flow rates from 0.25 to 250 g.p.m. can be handled with the various models.

The meter can be useful to meas-

RIGID SPECS EXCEEDED
on 30-Inch Marine Line



On Tennessee Gas Transmission Company's new 30-inch line across the Mississippi River Delta a high minimum radius of curvature was specified for laying the pipe. Houston laid the heavy, cement-coated pipe while maintaining a radius exceeding the specification by a full 20%. Houston Contracting's enviable reputation for quality construction has been built on performance such as this.

HOUSTON CONTRACTING COMPANY
2807 BUFFALO SPEEDWAY
HOUSTON 6, TEXAS
Laurence H. Favrot
R. P. Gregory
H. J. Muckley
Geo. A. Peterkin
OIL • GAS • PRODUCTS • WATER PIPELINES
104

TOP PERFORMANCE

ANOTHER
PARKERSBURG
OUTSTANDING
ENGINEERING
ACHIEVEMENT

THAT ALL ADDS UP TO PARKERSBURG

CHAIN-DRIVEN OR GEARED PUMPING UNITS

Careful attention to detail, from engineering to the complete product, is your assurance of dependable performance in every **PARKERSBURG** Pumping Unit. From the smallest to the largest heavy-duty units, **PARKERSBURG** Pumpers are famous for economy and longer trouble-free operation.

PARKERSBURG for pumping units of every type to meet every need.

PARKERSBURG for the most complete line of *wide-base portable units.*

PARKERSBURG for *quality products* at *competitive prices.*

PARKERSBURG for *experience* and *know-how* . . . over 25 years in the pumping unit field.

PARKERSBURG for a *field service* surpassed by none.

PARKERSBURG for the most *prompt delivery* possible, direct to your lease.

THE PARKERSBURG RIG AND REEL CO. — PARKERSBURG, WEST VIRGINIA — MADE IN U.S.A.

See Your
PARKERSBURG
Man Today!

THE
PARKERSBURG
RIG AND REEL COMPANY
Division of Parkersburg-Aetna Corp.

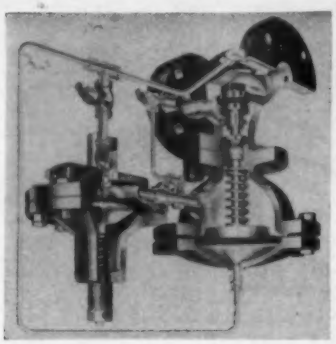
HOUSTON • TULSA • PARKERSBURG

PESA

Parkersburg Pumping Units are available through the following supply stores: American Pipe & Supply Co., Beacon Supply Co., Bovaird Supply Co., Canadian Equipment Sales & Service Co., Ltd., C. W. Cotton Supply Co., Franklin Supply Co., Houston Oilfield Material Co., Inc., Industrial Supply Co., Iverson Supply Co., Midland Supply Co., Inc., Mountain Iron and Supply Co., Murray-Brooks, Inc., The Producers Supply & Tool Co., Republic Supply Co., Rodman Supply Co., Superior Iron Works & Supply Co., United Supply & Manufacturing Co., Wilson Supply Co.

ure jet fuel, gasoline, oil, water, acids, and alkalies with a pressure drop of less than 5 psi. A single-bearing design is used to lower rotor inertia and friction. The maker's standard unit has a ball bearing for the shaft. The flowmeter is made of stainless steel and can be taken apart and put together again without affecting calibration. **Contact Manufacturer: George L. Nankervis Co., 15400 Fullerton Avenue, Detroit 27, for details on Type 20 turbine flowmeter.**

●



New pressure-reducing valve

. . . that uses pressures from within the valve for control has been recently developed. The valve can be used to control either compressible or noncompressible fluids without a change in design. All pipe connections are fabricated within the flanges of the main valve, making installation easy. The unit comes ready to bolt in place and put in service.

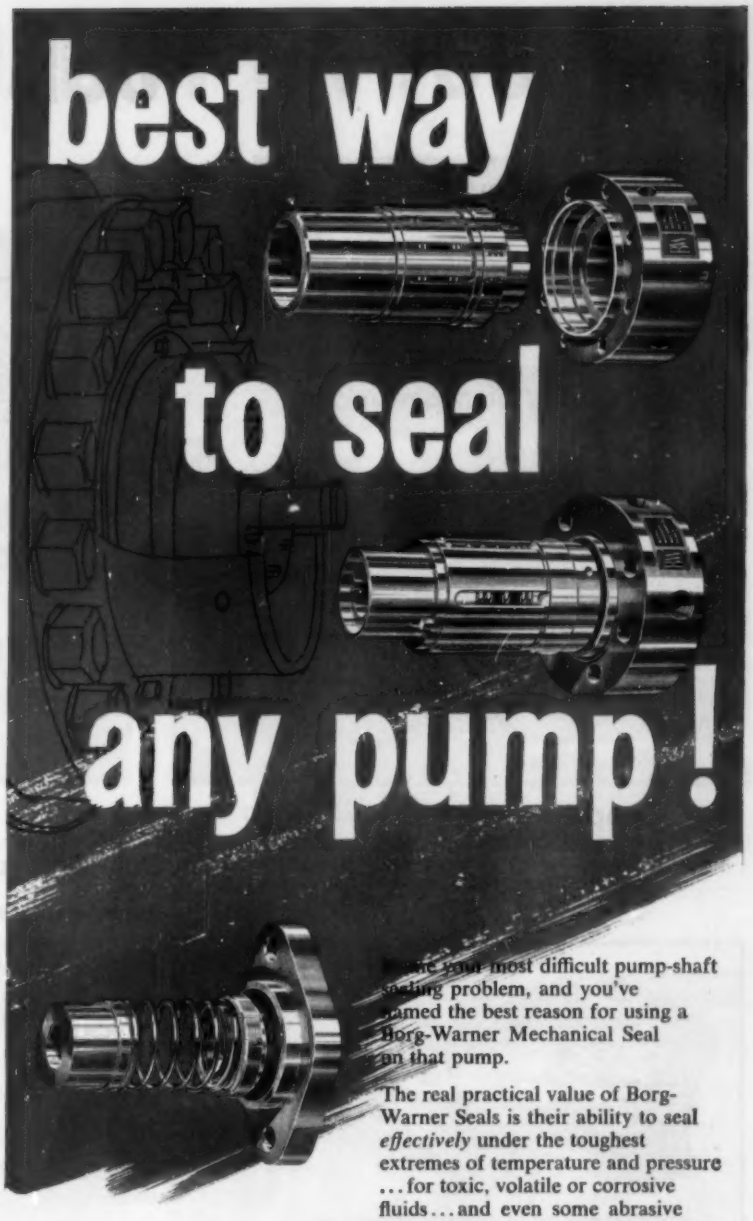
One noteworthy feature is the compactness of the Class AD valve. Activation and sensing are directly from the main-valve flanges. The stems are fully guided. Both the pilot and main valve can be in any position convenient to the piping system or location. Reduced pressure is adjustable from 0 to 125 psig. by the use of any one of three springs that are easily interchanged without removing the valve from service. Reductions can be as high as 600 to 1 psig. **Contact Manufacturer: C. E. Squires Co., 18502 Syracuse Avenue, Cleveland 10, for details on Class AD valve.**

●

50-lb. industrial X-ray generator

. . . has been recently announced that is small enough to pass through a 6-in. opening. Yet it is strong enough to radiograph 1¼-in. steel in 45 seconds.

The 140-kv. machine is designed for fast on-the-job inspections by one



...most difficult pump-shaft sealing problem, and you've named the best reason for using a Borg-Warner Mechanical Seal on that pump.

The real practical value of Borg-Warner Seals is their ability to seal *effectively* under the toughest extremes of temperature and pressure ... for toxic, volatile or corrosive fluids ... and even some abrasive liquids. *Result*—less down time, elimination of expensive stuffingbox maintenance, and savings of the pumped fluid.

Borg-Warner Mechanical Seals

NOW AVAILABLE—a new file folder of Borg-Warner Mechanical Seal designs shows some of the many types and applications possible for pumps, mixers, autoclaves and for special rotating shaft problems. Send for your copy today—there's no obligation!

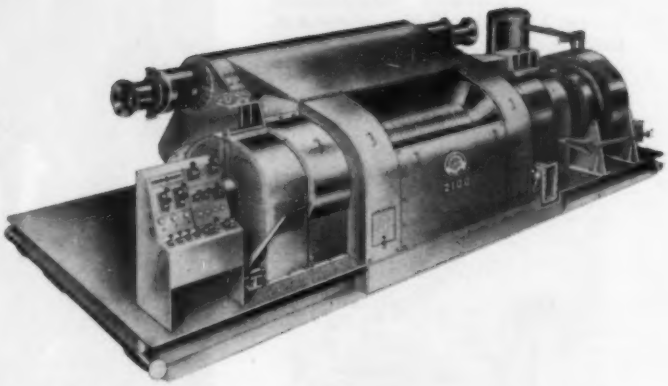
A PRODUCT OF B-W BORG-WARNER

Borg-Warner® Mechanical Seals

P. O. Box 2017, Terminal Annex, Los Angeles 54, California

USE GARDNER-

- Drawworks
- Mud pumps
- Air drilling compressors
- Well servicing pumps
- Rig air compressors
- Air hoists
- Impact wrenches



GD-2100 hp Drawworks

Gardner-Denver engineered for the deepest drilling today and tomorrow. More than 130,000-lb. single line pull. Moved in one load.

Only Gardner-Denver builds all these quality items for your rig

They're engineered for mobility, rugged dependability and simplified maintenance on location . . . designed by men who know your field requirements from firsthand experience . . . built to help you cut costs and drill faster.

Gardner-Denver oil field specialists on call in strategically located cities at all major oil field areas. Parts stocked in supply stores and Gardner-Denver warehouses throughout the oil world.

WITH A HARD HAT ON HIS DRAFTING BOARD

Gardner-Denver engineers spend time in the field, watching equipment at work . . . learning what you expect it to do. That's why Gardner-Denver equipment serves you better. *There's no substitute for men*—our 100-year philosophy of growth.

GARDNER-DENVER Since 1859 100 1959 YEARS

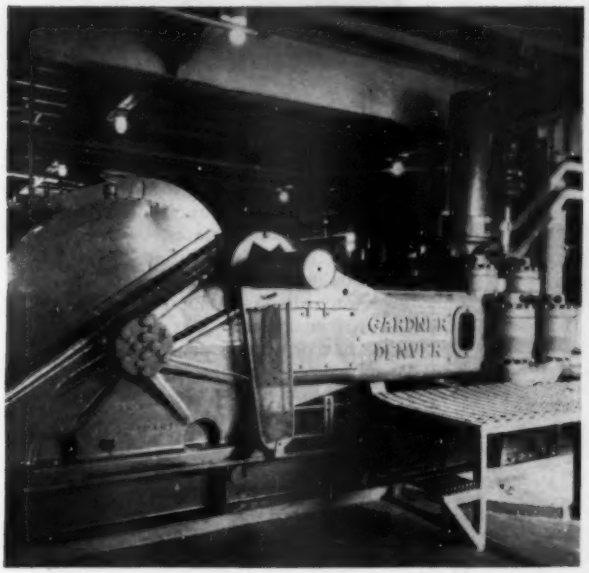
EQUIPMENT TODAY FOR THE CHALLENGE OF TOMORROW

GARDNER - DENVER

Gardner-Denver Company, Quincy, Illinois

In Canada: Gardner-Denver Company (Canada), Ltd., 14 Curity Ave., Toronto 16, Ontario
Gardner-Denver Export Division, 233 Broadway, New York 7, N. Y.
Oil Field Offices: Casper, Cleveland, Columbus, Corpus Christi, Dallas, Denver, Durango, Edmonton, Ellinwood, Evansville, Houston, Huntington, Jackson, Kansas City, Lafayette, Los Angeles, Mexico City, New Orleans, Odessa, Oklahoma City, Pittsburgh, San Francisco, Shreveport, St. Louis, Tulsa, Wichita, Winnipeg

DENVER QUALITY ON YOUR RIG

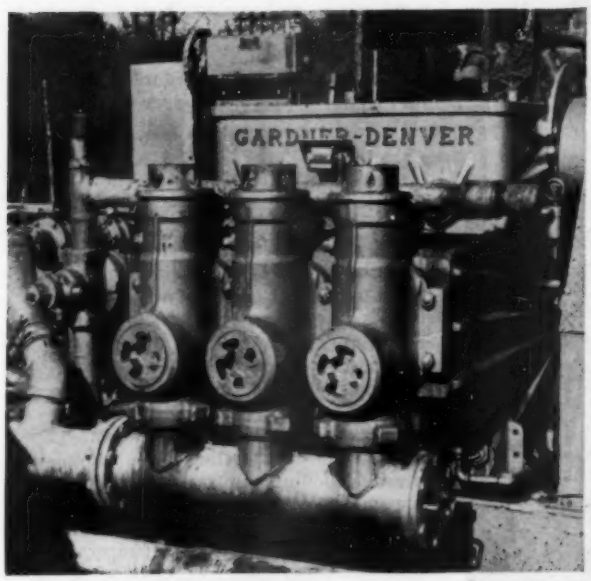


Gardner-Denver Mud Pumps

Famous Gardner-Denver eccentric construction. Divided fluid end cylinders. Models to 1250 hp to meet capacity and pressure needs of every rig.

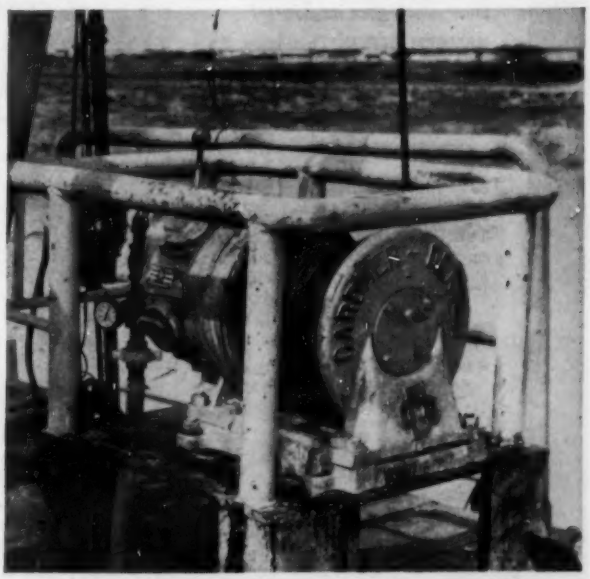
Air Drilling Compressors

Packaged units completely engineered by Gardner-Denver. Cooling system designed for continuous service. Field-proved for air or gas drilling, mud aeration.



Well Servicing Pumps

Triplex and six-cylinder plunger pumps for cementing, acidizing, fracturing or work-over. Provide squeeze pressures to 10,000 psi.



Compressed Air Power

Gardner-Denver air hoists handle snaking and lifting jobs. Impact wrenches and air tools speed maintenance, rigging up and tearing down.

man. It can be valuable for radiographing pipe, pressure vessels, storage tanks, and tank cars to find inner flaws in metal. Operating on most available power-supply lines, the machine consists of two parts. One is the 50-lb. generator. The other is the 55-lb. control.

With the control, the operator can select voltages from 50 to 140,000 volts and currents from 1 to 4 ma. The meters and stepless controls permit constant monitoring during each exposure, preventing the need for retakes due to line-voltage fluctuations, etc. Both the generator and control are sealed to permit uninterrupted use, even in heavy rain. **Contact Manufacturer: Picker X-ray Corp., 23 South Broadway, White Plains, N. Y., for details on 140-kv. X-ray.**

●

Putty to smooth sharp corners

. . . of pipe fittings before the application of pipe-protection tape has just been announced. Called Scotchrap pipe-insulation putty, the compound was developed to make easier the taping of irregular shapes such as tees and couplings. It provides a smooth taping surface that practically does away with wrinkles or buckles in the tape. Also, possible voids under the tape can be positively filled.

To use the putty, press it into place at the irregular surfaces, such as shoulders, on the pipe fittings, joints, and couplings, and mold it with the fingers to obtain a tapered surface. The maker reports that the putty stays waterproof and pliable. **Contact Manufacturer: Minnesota Mining & Mfg. Co., 900 Bush Avenue, St. Paul 6, for details on Scotchrap putty.**

●

New line-stopper tool

. . . makes it possible to install an inexpensive plug in lines operating under pressures up to 100 psi. when used in conjunction with a mechanical pressure-control fitting. Then it isn't necessary to leave the fittings in place to block off lines to be retired. Using this system, outlet valves on storage tanks may be exchanged without draining tanks. **Contact Manufacturer: Stanley F. Gotter Co., P. O. Box 560, North Hollywood, Calif., for details on Ficklin-Wilantt line-stopper tool.**

●

Circulating ring for pump seals

. . . just announced makes a desirable means for satisfactory pumping of water or light hydrocarbons at high temperatures. Developed for use with the Dura circulating seal, the circulating ring circulates the liquid from the pump stuffing box through a heat exchanger and returns it at a lower temperature to maintain the temperature within the stuffing box below the fluid boiling point at atmospheric pressure.

The result is that the liquid in the stuffing box is kept below a temperature that could cause precipitation of salts, minerals and other impurities with corresponding rapid wear of the contacting seal faces. Too, cooling the liquid reduces the possibility of flashing, protecting the seal against running without lubricant. The seal and

Full-View Masts
give ★ Derrick operating advantages
PLUS ★ Mast portability, economy & maximum utility
UNLIMITED VISIBILITY
This unique mast gives both driller and derrick man unlimited visibility.
GREATER FLOOR SPACE Measurements: 24' from drawworks to pipe rack: 27' 8" from side to side. Ample room to place independent rotary drive. No gin pole legs near drawworks. No erection A-frames. Lever lift raising legs carry load after erection of mast.
MAXIMUM SAFETY This mast does not go over centre during erection . . . centre of gravity remains on pipe rack side of main leg pedestals. No snubbing lines while erecting . . . no winch lines to lower.
Excellent stability and rigidity.
ECONOMICAL TO RIG UP OR MOVE
The Full-View Mast combines operational advantages found in standard drilling derricks plus lower cost of moving and rigging up. Planned assembly and erection cut labour and equipment costs.
ROADABILITY Complete mast columns travel with 7' 10" road width and all raising tackle assembled.
IDECO
WOODFIELD
WOODFIELD ROCHESTER LIMITED · ROCHESTER · ENGLAND
Telephone Strand 7842 Telex 89100 LONDON OFFICE, 147 VICTORIA STREET S.W.1

POSITIVE CONTROL OF MATERIALS IN MOTION BIF METERS FEEDERS CONTROLS

On Texas Eastern's
Little Big Inch . . .

Fast, Accurate BIF *Proportioneers*

Meter Accounting System Means . . .

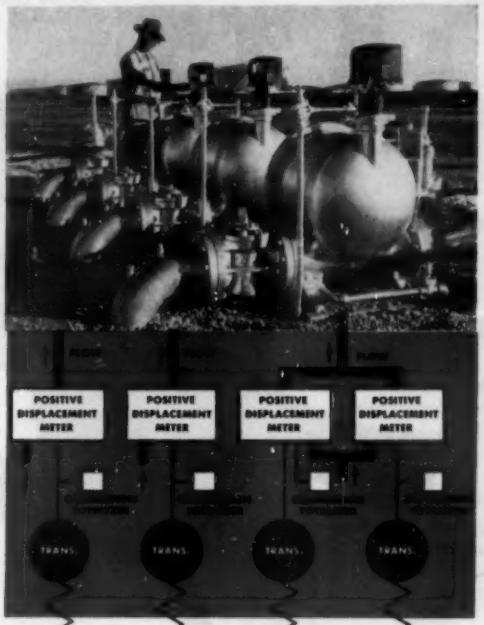
Calibrated accuracies to ±.02%!

All read-outs automatically corrected for meter factor and temperature!

Human error eliminated . . . better quantity accounting of products delivered to and received from their shippers!

At stations along Texas Eastern's 1168 mile, 20-inch products pipeline, fully automatic integrating meter consoles print out summated quantities of products received and delivered through banks of PD meters. The Little Big Inch is capable of handling 185,000 BPD with speed and accuracy possible *only* with automatic equipment. Labor costs are reduced as Proportioneers Meter Accounting Systems streamline the entire products accounting phase of operation.

For fast, accurate, continuous pipeline accounting, investigate the addition of Proportioneers consoles to your existing meters.
For Bulletin SM-3280, write
B-I-F Industries, Inc., Dept. P,
377 Harris Avenue, Providence 1, R. I.



See us at
5th World Petroleum Congress,
Booth #709

B-I-F

B-I-F INDUSTRIES

BUILDERS-PROVIDENCE · PROPORTIONEERS · OMEGA

NEED QUICK DELIVERY OF CASING?

Just contact the nearest stocking point for Armco Casing

New steels are born at Armco

Armco Slip-Joint Casing is distributed by National Tank Company from 21 locations throughout the oil country. Chances are, you can get immediate delivery from the stocking point nearest you. National Tank's representatives will also promptly handle your order for direct mill shipments.

For complete data on Armco Casing, write for catalog, "Armco Casing for Oil and Gas Wells." Armco Drainage & Metal Products, Inc., 6969 Curtis Street, Middletown, Ohio, or 201 KOME Building, Tulsa, Oklahoma.

National Tank Company stocking points for Armco Casing

Illinois
Clay City

Indiana
New Harmony

Kansas
El Dorado
Great Bend

Louisiana
Harvey
Lake Charles
New Iberia
Shreveport

Montana
Roundup

Nebraska
Kimball
Sidney

New Mexico
Farmington
Hobbs

North Dakota
Newtown
Tioga
Williston

Oklahoma
Oklahoma City
Seminole

Texas
Houston
Odessa
Pampa
Perryton
Snyder

Wyoming
Casper

ARMCO DRAINAGE & METAL PRODUCTS

Subsidiary of ARMCO STEEL CORPORATION

OTHER SUBSIDIARIES AND DIVISIONS: Armco Division • Sheffield Division • The National Supply Company
The Armco International Corporation • Union Wire Rope Corporation • Southwest Steel Products

Koenig ALL-STEEL SERVICE BODIES

Each body electrically welded into one unit with bed reinforced. Sturdy and economical . . . weatherproof compartments with recessed paddle-handle door locks.

Write for literature on service bodies, line-construction bodies, side boxes, and King Winches.

KING WINCHES

P.T.O.-driven King Winch on Willys Jeep FOR ALL WILLYS JEEPS, 4 WD TRUCKS AND 4 WD STATION WAGONS.

A-11 King Winch on A-128 (4 x 4) International truck. There's a front-mount King Winch designed to fit your specific needs . . . for ½-ton through 2½-ton trucks . . . pulling capacities of 6,000 to 19,000 lbs.

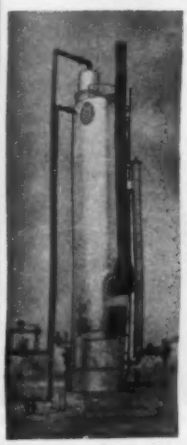
Power-take-off-driven King Winch models 130J and 131J for CJ-3B and older-model Jeeps, can be transferred to CJ-5 and CJ-6 Jeeps . . nothing extra needed.

King Winches for International trucks available through International dealers.

Koenig cabs and King Winches for Willys vehicles available through all Willys dealers.

Koenig IRON WORKS, INC.
P. O. BOX 7726, HOUSTON 7, TEXAS

For MAXIMUM RECOVERY



AT LOWEST COST

TYPE P-V PRESSURE TREATERS

M&V TANK COMPANY
Wichita Falls, Texas

TANKS - TREATERS SEPARATORS

Steel Fabrication for the Oil Industry

circulating ring are applicable for pump pressures to 600 psi. and pumping temperature up to 750° F. **Contact Manufacturer: Durametallic Corp., Kalamazoo, Mich., for details on circulating ring.**

•

Differential-pressure indicator

. . . now obtainable raises a red button to view when the differential pressure in a system exceeds a stated value. The unit is activated by differential pressures as low as 5 psi. in systems with an internal pressure as high as 5,000 psi.

The Deltadyne indicator is quite small—1 by 1¾ by 2 in.—and weighs only a little over ¼ lb. It can be used at temperatures from —65° up to 275° F.

Among its potential uses are detecting clogging and filters, spray nozzles, and injection nozzles. It can also be used to determine if excessive pressure drop occurs in any part of a hydraulic or other fluid system. With an orifice or other flow restrictor, it can be used to detect insufficient or excessive flow. **Contact Manufacturer: Aircraft Porous Media, Inc., 30 Sea Cliff Avenue, Glen Cove, N. Y., for details on Deltadyne differential-pressure indicator.**

•

Insulated anode for separators

. . . heater treaters, gun barrels, filters, and condensers is now being made available for cathodic protection of such equipment. Called a Victode, it has the insulating head molded as an integral part of the anode body. It has a permanent insulation and support and provides a leakproof connection with the use of gaskets. Easy to install, the anode can be obtained of magnesium, zinc, treated graphite, or other materials.

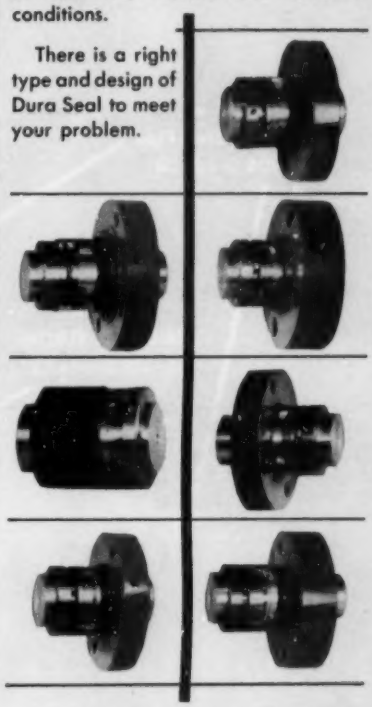
It is designed for use in a horizontal position. **Contact Manufacturer: Tejas Plastics Materials Supply Co., P. O. Box 11302, Fort Worth, Tex., for details on Victode.**

DURA SEAL means VERSATILITY in mechanical sealing

Dura Seal is the most extensive line of mechanical seals offered to industry today . . . meeting a wider range of pressures, temperatures and liquids.

Dura Seal is backed by 25 years of experience in the successful sealing of corrosive, volatile and abrasive conditions.

There is a right type and design of Dura Seal to meet your problem.



For further details, write for free copy of Catalog No. 480OG

The PERFECT SEAL

DURAMETALLIC CORPORATION
KALAMAZOO, MICHIGAN

Always Stronger Than They Need Be!

MIDWEST
WELDING FITTINGS

Below are photographs of two of the many tests that have been made of Midwest Welding Fittings. The results are *always* the same . . . the seamless pipe to which the fittings are welded invariably bursts. There is *never* any sign of fitting failure or weakness.

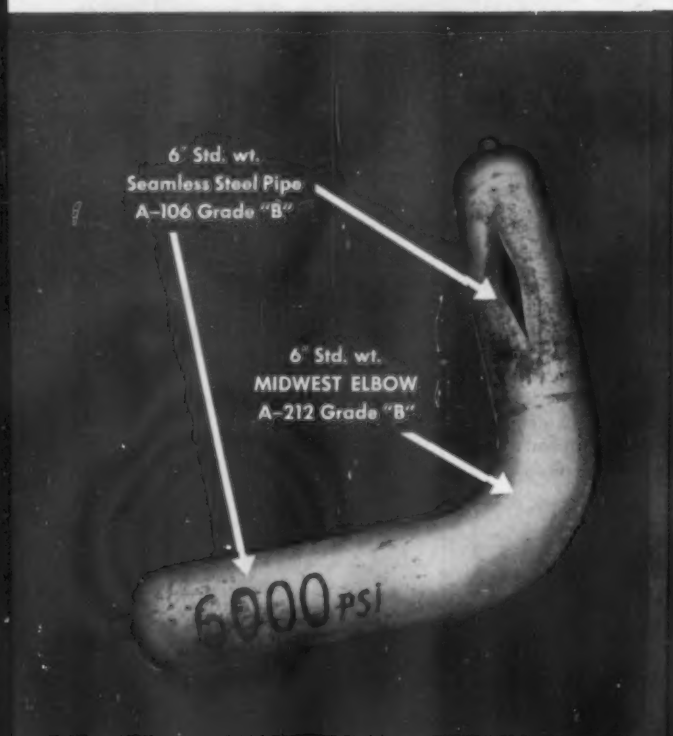
There's good reason for this. We make elbows and tees of inherently stronger metal . . . the Midwest exclusive method of manufacture enables us to maintain greater minimum wall thickness, and to reinforce the fittings at points of greatest stress. For the many other advantages of Midwest Fittings, ask your Midwest distributor or write us for Catalog 54.

MIDWEST PIPING COMPANY, INC.

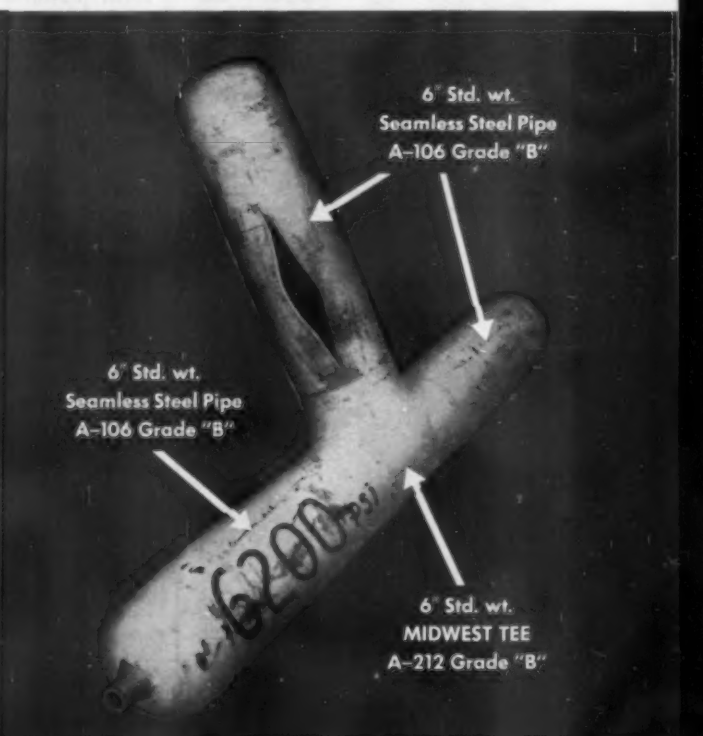
Main Office: St. Louis 3, Missouri (P. O. Box 433)
Plants: St. Louis, Clifton, N. J. and Los Angeles

SALES OFFICES:
ASHEVILLE—(BOX 446, SKYLAND, N. C.) • ATLANTA 9—72 11TH ST., N. E.
BOSTON 27—426 FIRST ST. • CHICAGO 3—79 WEST MONROE ST.
CLEVELAND 14—616 ST. CLAIR AVE. • HOUSTON 2—1213 CAPITOL AVE.
LOS ANGELES 33—520 ANDERSON ST. • MIAMI 34—2103 LE JEUNE RD.
NEW YORK 7—50 CHURCH ST. • PITTSBURGH 19—437 GRANT ST. • SAN FRANCISCO 11—420 MARKET ST. • ST. LOUIS 4—1450 SOUTH SECOND ST.
TULSA—1640 E. 21ST ST.

STOCKING DISTRIBUTORS IN PRINCIPAL CITIES



Typical bursting test of stock Midwest Welding Elbow. As is always the case, failure occurred in the seamless pipe while the elbow was undamaged. Bursting pressure was 6000 psi . . . considerably above the required code minimum for seamless pipe. (Minimum allowable bursting pressure for 6" standard weight A-106 Grade B seamless steel pipe is 4438 psi.)



Bursting test of Midwest Welding Tee taken at random from stock. As always, the failure occurred in the seamless pipe and not in the fitting. The non-shock internal bursting pressure of 6200 psi is well above the code minimum for seamless pipe. (Minimum allowable bursting pressure for 6" standard weight A-106 Grade B seamless steel pipe is 4438 psi.)

7761

MIDWEST **WELDING FITTINGS IMPROVE PIPING DESIGN AND REDUCE COSTS**

SHOWCASE . . .

New Literature

Lever-hoist safety chart

. . . suitable for wall display is being offered free of charge. The 17 by 21-in. chart contains a set of "do" and "don't" safety rules, complete with drawings. A large cutaway photo of a lever-operated hoist is in the center of the chart. **Contact Manufacturer: Manning, Maxwell, & Moore, Inc., 414 Broadway, Muskegon, Mich., for Lever-Hoist Safety Chart.**

Revised sucker-rod Bulletin 486

. . . covers five grades, including new Grade 85 (133,000 psi.). The eight-page bulletin gives chemical and mechanical properties of the steel, dimensions, and weights, and illustrates a new packaging method. It also includes specifications of pony and polished rods, and couplings. **Contact Manufacturer: National Supply Co., Two Gateway Center, Pittsburgh 22, for Bulletin 486.**

Specialty drilling tools and products

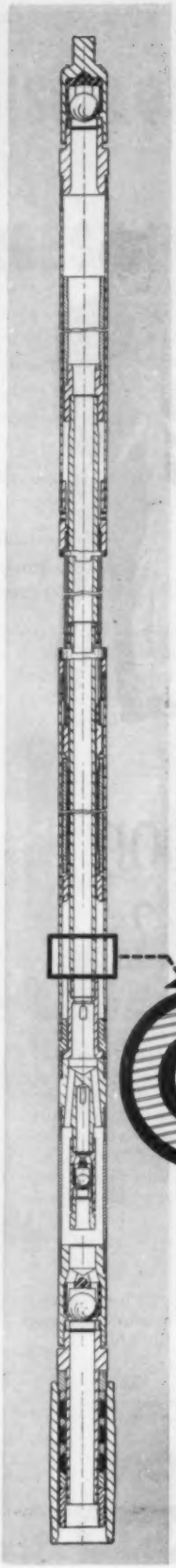
. . . are illustrated in a new available eight-page brochure. It details a centralizer specially designed for various operating conditions, a well-bore wiper, a stop collar, a special no-weld compound, and a lost-circulation additive. **Contact Manufacturer: Pathfinder Oil Tool Co., P. O. Box 13275, Houston 19, for Specialty Tools and Products brochure.**

Portable moisture monitors

. . . are detailed in illustrated Bulletin 1834C which gives applications, features, operating characteristics, specifications, and other details. The eight-page literature lists two types of instruments for monitoring or controlling moisture in gases or gaseous mixtures—one with a range from 1 to 1,000 p.p.m., the other with a 1 to 20,000-p.p.m. range. **Contact Manufacturer: Consolidated Electrodynamics Corp., 360 Sierra Madre Villa, Pasadena, Calif., for Bulletin 1834C.**

How to Decentralize

. . . with Centralized Control is the title of a bound, eight-page reprinted article, yours for the asking. The author points out that many companies, seeking a quick cure for organizational ills, have found that a



Get More Production with

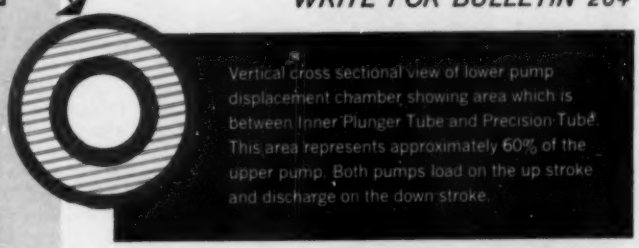
PACIFIC'S DOUBLE BARREL

Insert Rod Plunger Pump

This particular design of Pacific's Type "D" Insert Rod Pump is one of the many tried, and is the direct result of engineering proved by actual field tests and operation. Over a period of years this pump was developed so that it could be removed on the rods for servicing . . . yet produce at capacities equal to or greater than a Tubing Liner Pump. Many problems were encountered, but for each a satisfactory solution was found. The result is a most efficient and trouble free insert rod pump for handling large capacities.

The Type "D" Insert Rod Pump consists basically of two R. W. pumps in tandem. The upper pump is a Traveling Barrel Pump. The lower pump is a Traveling Plunger Pump.

WRITE FOR BULLETIN 204



Vertical cross sectional view of lower pump displacement chamber showing area which is between Inner Plunger Tube and Precision Tube. This area represents approximately 60% of the upper pump. Both pumps load on the up stroke and discharge on the down stroke.

PACIFIC PUMPS

Inc. . . A Division of Dresser Industries, Inc.

HUNTINGTON PARK, CALIFORNIA

Mid-Continent :
1358 So. Sheridan Ave., Tulsa 12, Oklahoma
Pacific Pumps of Canada, Ltd.,
Edmonton, Alberta

PACIFIC

DW-19

you road-test
a car before
you buy it...

...why not
"road-test" this
Banking connection
in oil-rich Canada?

Test it . . . try it . . . see how it works. That's the American and Canadian way of coming to a decision.

And that's why we are anxious to have you *try* our special banking services for oil and gas men before you decide on establishing a Canadian banking connection. Our experienced Oil and Gas Department in Calgary is close to all phases of this growing industry, knows trends and credit standings and qualified distributors of equipment. We can give you up-to-date facts and figures about Canada's great natural gas industry.

Whatever your banking problem or need involving Canadian oil and gas, we'd like the opportunity to help you solve it. Instead of just talking about our facilities and service, we're saying "see for yourself."

With more than 500 branches coast to coast, including all the major oil fields, "The Bank" is in a unique position to give you on-the-spot banking help and information on the oil and gas industry.

Take advantage of this demonstration offer. Get in touch with us today. Send for your copy of our map showing Western Canada's oil and gas fields and pipelines—plus Toronto-Dominion branches in the area.

THE

Write, call or wire Mr. W. F. Sadler
Oil and Gas Department
114 8th Avenue, W., Calgary, Alberta

TORONTO-DOMINION

Head Office: Toronto, Ontario
New York Agency:
28 Broadway, New York 4, N. Y.

BANK

fast dose of decentralization can do more harm than good.

Only a well-managed concern can decentralize with success, and then only under certain conditions, the article states. It continues that once decentralization is accomplished, it can break the shackles of inertia and give every individual in the company added opportunity to win tangible recognition for whatever he accomplishes. **Contact: Remington Rand Div., Sperry Rand Corp., 315 Fourth Avenue, New York City 10, for Brochure RT 8952.**

Infrared accessory data sheets

. . . describe a variable thickness liquid-absorption cell, 7.5 - cm. - volume gas cell, and an evacuable potassium-bromide die—accessories for infrared spectrophotometers. The three two-page data sheets (IR-AC-001-57, IR-AC-003-58, and IR-AC-002-58) describe operations and offer illustrations of typical spectra obtained by use of the accessories. **Contact Manufacturer: Instrument Div., Perkin-Elmer Corp., Norwalk, Conn., for Infrared Accessory Data Sheets.**

Centrifugal and rotary pumps

. . . for a wide range of industrial uses are described and illustrated in a 72-page, two-color catalog. It features the new Pioneer open-impeller centrifugal pump, in both sealed and sealless types, along with the Rollway mechanical positive-displacement rotary pump.

The publication covers pumps designed for special conditions of temperature, viscosity, specific gravity, lubricating characteristics, chemical properties, contaminants, and abrasives.

It includes descriptions and specifications of pump parts and accessories, including self-contained coolant units. **Contact Manufacturer: Pioneer Pumps, Detroit Harvester Co., 21800 Greenfield Road, Oak Park 37, Mich., for Pioneer Pumps catalog.**

Packaged automatic-control panels

. . . for gas-engine-driven compressors are outlined in new 10-page Bulletin 170. Three basic panels described are: (1) Model SF, sequenced engine control which enables operator to start or stop the engine by pushing a single button; (2) Model SEC, fully automatic engine and compressor control which monitors and controls automatically all phases of engine, compressor, and yard valve operation from start

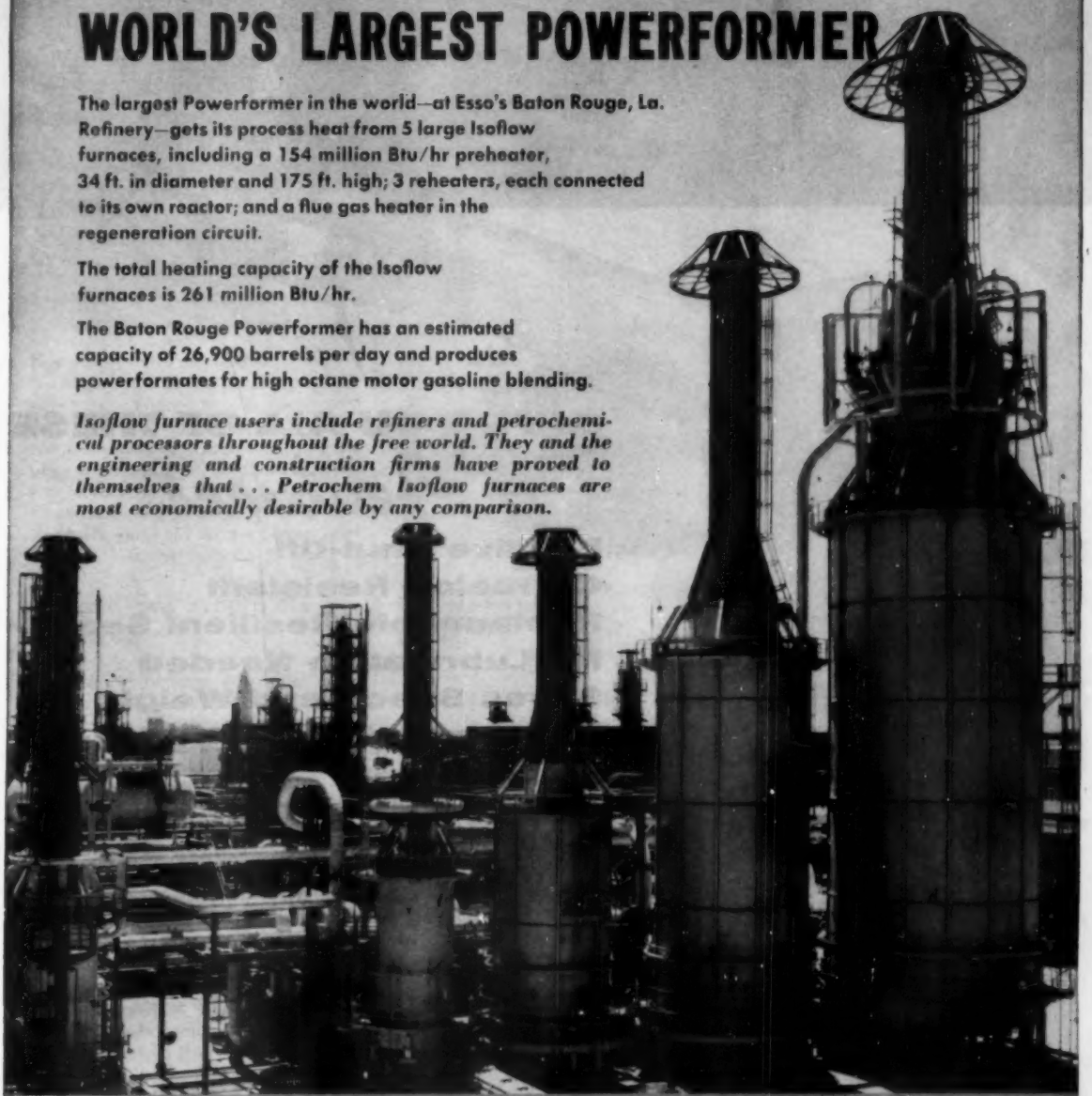
PETROCHEM-ISOFLOW HEATERS
charge
WORLD'S LARGEST POWERFORMER

The largest Powerformer in the world—at Esso's Baton Rouge, La. Refinery—gets its process heat from 5 large Isoflow furnaces, including a 154 million Btu/hr preheater, 34 ft. in diameter and 175 ft. high; 3 reheaters, each connected to its own reactor; and a flue gas heater in the regeneration circuit.

The total heating capacity of the Isoflow furnaces is 261 million Btu/hr.

The Baton Rouge Powerformer has an estimated capacity of 26,900 barrels per day and produces powerformates for high octane motor gasoline blending.

Isoflow furnace users include refiners and petrochemical processors throughout the free world. They and the engineering and construction firms have proved to themselves that . . . Petrochem Isoflow furnaces are most economically desirable by any comparison.



PETROCHEM-ISOFLOW FURNACES

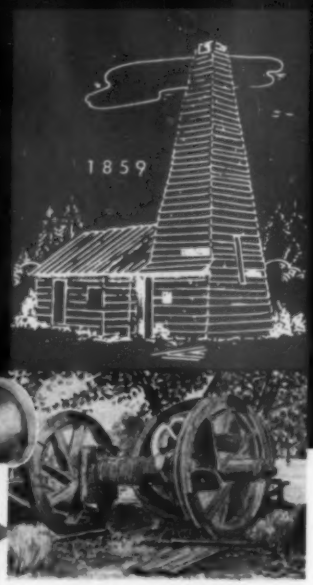
UNLIMITED IN SIZE . . . CAPACITY . . . DUTY

PETRO-CHEM DEVELOPMENT CO., INC. • 122 EAST 42nd St., New York 17, N. Y.

REPRESENTATIVES: Rawson Co., Baton Rouge • Rawson-Houlihan Co., Houston • Wm. H. Mason, Tulsa • Lester Oberholtz, Los Angeles • Faville-Levally, Chicago • D. B. Foster, Pittsburgh • Turbex, Philadelphia • Flagg, Brackett & Durgin, Boston G. W. Wallace, Denver, Salt Lake City & El Paso International Licensees and Representatives: Birwelco Ltd., Birmingham, England • Societe Anonyme Heurtey, Paris, France • Societe Anonyme Belge Heurtey, Liege, Belgique • Heurtey Italiana S.P.A., Milan, Italy • Petrochem G.M.B.H., Dortmund, Germany • SETEA-S.A. Comercial, Industrial, y de Estudios Tecnicos, Buenos Aires, Argentina

GREATEST DISCOVERY SINCE THE DRAKE WELL...

ONLY KEYSTONE valves



The original replaceable resilient seat is also the gasket between flanges

GIVE YOU ALL OF THESE *Features*

Positive Shut-Off
Corrosion Resistant
Replaceable Resilient Seat
No Lubrication Needed
Saves Space and Weight
Economical in Price

PRESSURE RATING: Keystone resilient seated valves ¼" through 20" available in 150 P.S.I.; valves 24" through 48" available in either 50 P.S.I. or 125 P.S.I.

KEYSTONE VALVES are designed and recommended to meet a wide variety of plant and field requirements for throttling or shutting off completely liquids, gases, slurries and solids. Some of the many proven applications are acetylene, air, acids, alcohol, alkalis, ammonia, bromine, beer, catalyst, condensate, cement (dry or slurry), low pressure steam, paper stock, river water, sea water, vacuum, dust and vapor accumulations, edible oils, hydrocarbon gases, lube oil, gasoline, cooling water for condensers and turbines, salt water disposal systems, soap, latex, molasses, and many other services too numerous to mention.

Write for Valve Catalog and complete information.

KEYSTONE VALVE CORP.

5325 Kirby Drive • P. O. Box 6716 • Phone JA 6-3571 • Houston 5, Texas

KEYSTONE VALVE CORP. ®

REPRESENTATIVES IN VARIOUS CITIES THROUGHOUT THE WORLD

to stop; (3) Model SEC-R, fully automatic control for remote location which can be located in a control area at a distance from the machine.

It's also suitable for tie-in with computers at a central dispatch office to program, monitor, and automatically control an entire pipeline system. **Contact Manufacturer: Clark Bros. Co., P. O. Box 560, Olean, N. Y., for Bulletin 170.**

Salvage and plant housekeeping

. . . bulletin describes cleaning procedures which make it economical to reclaim scrap parts. Bulletin 3 points out that cleaning represents at least 50% of salvage operations.

It describes two compounds which remove grease, oil, rust, and paint in a simple soaking application. The literature gives specifications for construction of a salvage tank and tells how to prevent rust after cleaning.

Other subjects covered in the 12-page publication are cleaning steam turbines; removing scale and carbon from compressors; and cleaning vacuum filters, painted equipment, electric motors, tank cars, barges, and tank trucks. **Contact Manufacturer: Oakite Products, Inc., 159 Rector Street, New York City 6, for Bulletin 3.**

Oil and gas separators are sized

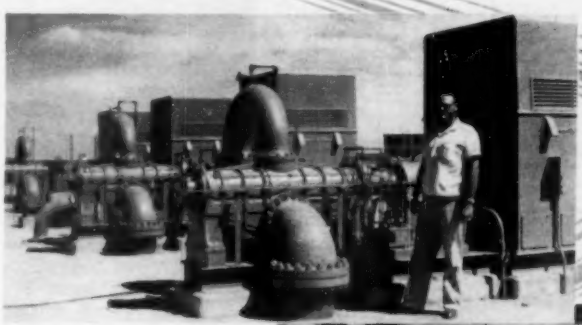
. . . quickly and accurately for a wide range of well-stream conditions by a new method described in 114-page Catalog 30. The method reduces affecting conditions and characteristics to factors, and incorporates the factors into a universally applicable equation.

Factor values have been precalculated and tabulated to permit visual selection of separator sizes rather than mathematical computations of the correct value for a specific condition or characteristic. **Contact Manufacturer: Black, Sivalls & Bryson, Inc., 7500 East Twelfth Street, Kansas City 26, Mo., for Catalog 30.**

Recover All the Oil Possible

. . . is the title of a new 20-page handbook, which describes methods and services available to produce more oil. The publication outlines the latest techniques and equipment and includes such services as core analysis, flood evaluations, miscible-phase drive, secondary-recovery techniques, P-V-T evaluations, and recovery research. **Contact: Petroleum Technologists, Inc., 7101 Empire Freeway, Dallas, for Recover All the Oil Possible handbook.**

Warren's High Pressure Screw Pump is proving its true economy with pumping efficiencies of 75% to 85% – on either high or relatively low viscosities



Warren #8CB Screw Pumps handling crude oil at a primary pumping station.

In crude line, product line and refinery jobs Warren High Pressure Screw Pumps —

- develop continuous flow
- can be direct driven . . . speed reduction gears are not necessary
- maintain constant capacity and pressure, even on oil containing foreign matter
- are suitable for unattended stations.

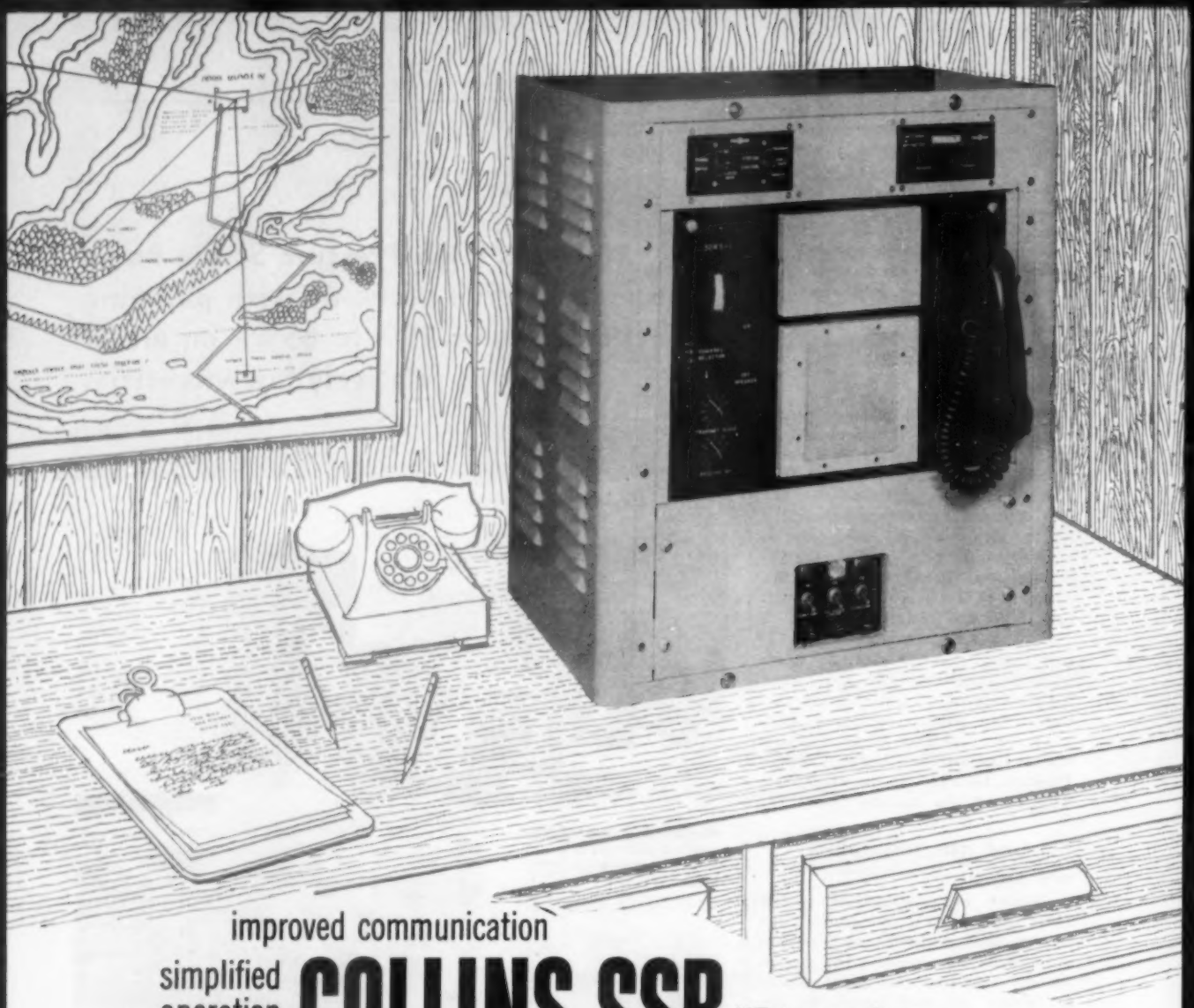
WRITE FOR SELECTION NOMOGRAPH #252

CENTRIFUGAL · SCREW · RECIPROCATING · GEAR

WARREN PUMPS, INC.

WARREN, MASSACHUSETTS

0-1



improved communication

simplified operation with **COLLINS SSB** HF transceiver

The compact Collins 32RS-1 offers the full advantages of Single Sideband: more talking power, less bandwidth, and immunity to selective fading. True simplification for even non-technical operators has been achieved by design excellence, not compromise. Highly stable circuits assure "on frequency" operation without an additional manual adjustment control. Simplified, improved design gives long, reliable service.

The 32RS-1 can provide up to 4 crystal-controlled frequencies in the 1.6 to 15 mc range, selected by a flick of a selector switch. In transmission it provides 100 watts peak envelope power output — Single Sideband "talking power" 3 db higher under normal conditions, 9 db higher under severe fading, than that of AM equipment with equivalent rating. A balanced modulator and Mechanical Filter sideband generator, multiple tuned circuits and linear amplifier assure a clean signal in transmission, while automatic load control maintains a high level of "talking power" by compensating for changes in voice level. In reception the Mechanical Filter provides excellent selectivity for the desired signal and rejection of off-channel interference.

A special feature of the 32RS-1 is VOX control, with the transmitter actuated by the voice of the person speaking over the circuit. This makes it possible to operate the transceiver through telephone extensions or switchboards without extra push-to-talk switches.

The 32RS-1 also simplifies the maintenance technician's task, with components and maintenance adjustment controls readily accessible, and test meter and transmitter alignment generator built-in.

Contact your nearest Collins distributor or write for literature on the 32RS-1 and complete station accessories — antennas, antenna couplers, directional wattmeters and phone patches.

COLLINS

COLLINS RADIO COMPANY • CEDAR RAPIDS, IOWA • DALLAS, TEXAS • BURBANK, CALIFORNIA

EQUIPMENT MEN
. . . in the News

New store at Rangely, Colo. is completed by Jones & Laughlin . . . Supply Division to supply oil-field needs for customers in northwestern Colorado, reports Rainey Elliott, president of the division. The building, measuring 44 by 72 ft., has galvanized steel walls and roof. The front is faced with brick veneer 4-ft. high and 44-ft. in length. The store is under J&L's central Rocky Mountain district at Casper, Wyo. W. T. Fleming is store manager and T. G. Row is assigned as salesman.

Parkersburg appoints Rowley

. . . executive vice president and general manager of the company. The announcement was made by Bernard P. McDonough, president of Parkersburg-Aetna Corp. Parkersburg Rig & Reel is a division of the corporation. Craig M. Rowley previously served as manager of manufacturing and assistant to the president, with headquarters at Coffeyville, Kans. He was chief petroleum engineer of Sinclair Oil & Refining Co. in Venezuela before joining Pakersburg in 1957.

C. M. Rowley

Clyde M. Lackey is appointed

C. M. Lackey

. . . sales manager of Franks Division, Cabot Shops, Inc., announces C. C. Simmons, director of sales. Before joining the Pampa, Tex. firm, Lackey was with the sales division of Cardwell Mfg. Co. and Buda Engine sales and service in Kansas.

R. T. Bennett is transferred

. . . from Robinson, Ill., to Greensburg, Ky. as station manager, and H. W. Marsh from Mt. Pleasant, Mich. to Greensburg as service manager for Dowell Division of The Dow Chemical Co. The announcement comes from L. J. Kutlich, Dowell's district manager at Evansville, Ind.

Bennett joined Dowell at Salem, Ill. 18 years ago as an equipment operator. He has since served in the Tri-State area as a service engineer, area development manager, station manager, and sales engineer.

Marsh has been with the company at Mt. Pleasant since August, 1943, when he began work as a service engineer. He was promoted to service manager in 1953, the position he held until his recent transfer.

Bill E. Thomas is promoted

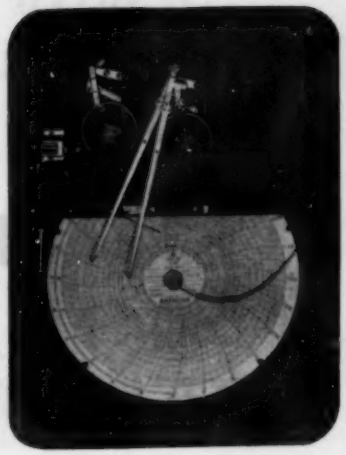
. . . to sales manager of Tuboscope Co., according to J. W. Bozeman, president. Thomas, who most recently was district manager in Houston, started with Tuboscope in 1950 as a trainee. He was made a unit operator in 1951 and became field supervisor 2 years later.

Bill E. Thomas

FWD Corp. sends serviceman

. . . to East Pakistan to put two cargo carriers, recently purchased by Standard-Vacuum Oil Co., into operation. Domenico Piccolo will train Pakistan oil-field workers to drive, service, and maintain the carriers—known as Teracruzers.

The Teracruzers, first of their kind built for commercial use, glide on



AMERICAN®
INTEGRATING
ORIFICE
METERS

American Integrating Orifice Meters provide more accurate measurement by the continuous multiplication of the square root of the measured differential by the square root of the absolute line pressure.

Single, double and duplex-integrating models available in a wide range of manometer types and working pressures. Dust-proof, die-cast aluminum cases... Gasclok and electric instrument chart drives. Also supplied with American Telecounter for remote readings.

Ask for Bulletin 401 for complete details.

AMERICAN®
METER COMPANY
INCORPORATED ESTABLISHED 1892
General Offices: Philadelphia 16, Pa.
Sales Offices in Principal Cities

HYCALOG

3 V-DOOR BITS
PATENT PENDING
AVERAGE OVER 5.1'/HR IN 14,000 FOOT TEXAS WELL

CONTINUING RESEARCH FOR LOWER COST DRILLING

The last 2637 feet of a 14,383 foot hole recently completed required only three HYCALOG V-DOOR diamond bits. Each stayed on bottom, making hole continuously until replaced. Here's the breakdown of each bit's performance:

From 11,744' to 12,792' a total of 1048 feet was drilled in 215 hours, averaging 5.0'/hr.

From 12,792' to 13,925', a total of 1133 feet, drilling time was only 240 hours at an average of 5.1'/hr.

From 13,925' to 14,383' (TD) totaling 458', drilling rate was increased to 5.5'/hr. And the bit, when pulled, was still in excellent condition.

The savings on this hole is enormous when performance of the V-DOOR bits is compared with the number of conventional rock bits . . . *and round trips* . . . which would have been required to make the same footage.

This is another of a growing heap of such records being set almost daily by HYCALOG V-DOOR *bits. Why not let* V-DOORS *set a record on your next drilling program?*

Hycalog, Inc.

505 AERO DRIVE
SHREVEPORT, LOUISIANA
BRANCH OFFICES IN PRINCIPAL OIL PRODUCING AREAS

DIAMOND CORING • DIAMOND BITS • WELL LOGGING • CORE ANALYSIS

huge high-flotation, low-pressure tires. They are able to traverse rough-ground areas inaccessible to conventional-type vehicles.

National Supply Co. shifts three

. . . in its export division. A. Robert Meyer, vice president, will function in a staff capacity devoting his attention to foreign manufacturing and licensing and developing international activities. Calvin B. Carter has been appointed manager of the export division, succeeding Meyer. James M. Davies will succeed Carter as division sales manager.

A. R. Meyer

C. B. Carter

J. M. Davies

Meyer, who started with the company in 1929, was named vice president and a director last year. Carter started with the company 22 years ago. He has been division sales manager since 1956.

Since 1957, Davies has served as manager of the eastern district of National Supply Co. of Venezuela, C. A., with headquarters at Anaco. He joined National in 1935.

Plastic Applicators, Inc., holds

. . . first sales meeting of 1959 at Houston. Twenty-five sales engineers and plant executives from Texas, Louisiana, Oklahoma, and New Mexico heard G. J. Duesterberg, president of the plastic-lining firm, announce record-breaking sales for the first quarter of the current fiscal year.

Expansion programs in plastic, cement, and rubber were described by Cordell Garner, vice president in charge of sales.

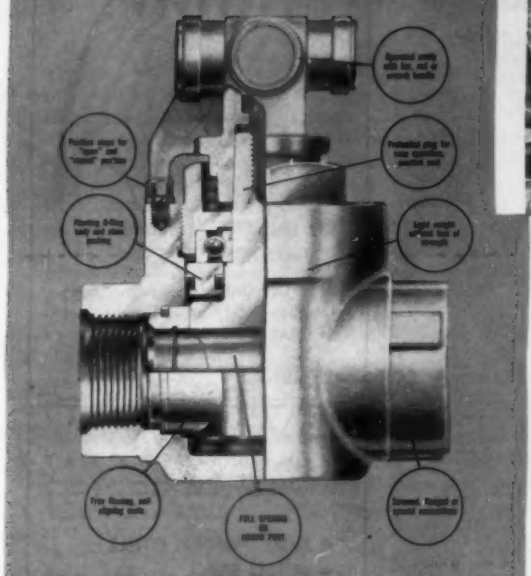
Petroleum Helicopters boosts

. . . its fleet by purchasing five Bell Model 47G-2 Troopers, three-place ships, reports Robert L. Suggs, president of Petroleum Helicopters, Inc.

The firm's assistant vice president for operations, L. L. McCombie, recently flew two of the ships from Bell Helicopter Corp.'s plant near Fort Worth to Petroleum's Lafayette, La., headquarters. Petroleum, a pioneer in

GRAHAM...

the PLUG VALVE that NEVER NEEDS LUBRICATION



Graham Non-Lubricated Plug Valves are available with threaded, flanged or special end connections; in sizes 1" through 4" and working pressures to 10,000 psi.

The cost of lubrication, or worse, the cost of failure to lubricate, are two problems you won't have when you use Graham Non-Lubricated Plug Valves on drilling rig lines, Christmas tree wings, flow lines, headers, manifolds, in processing plants and many oil and gas transmission operations.

Seats in the Graham Valve are free-floating . . . self-aligning . . . micro-fitted for bubble tight sealing. An extreme minimum of plug—body contact and bronze or ball thrust bearing hold down arrangement of plug assures optimum operating ease under full rated pressure.

Before specifying any valves for new installations or replacement, write for Graham Valve Catalog 581-GP.

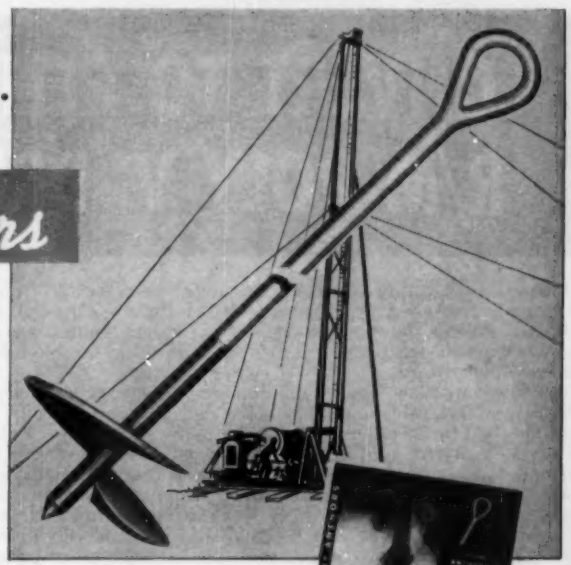
TXT TEXSTEAM Corporation

A SUBSIDIARY OF VAPOR HEATING CORPORATION

320 Hughes St. • P. O. Box 9127 • Houston 11, Texas • Phone WA 6-8853

Guy service and drilling rigs the fast, easy, inexpensive way with...

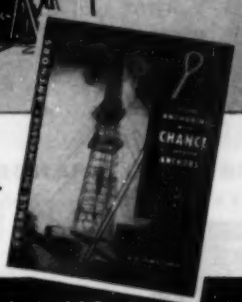
Chance Screw Anchors



Cut installation cost, save time, make sure your rigs are safely guyed.

Two men, using a piece of pipe or iron bar, can install Chance Screw Anchors in minutes. Chance Screw Anchors eliminate hole digging and hauling bulky, heavy, "dead man" anchors.

All steel, drop-forged and double arc-welded construction withstands heavy loads, rough use and re-use. Can be retrieved easily or left in place for future use.

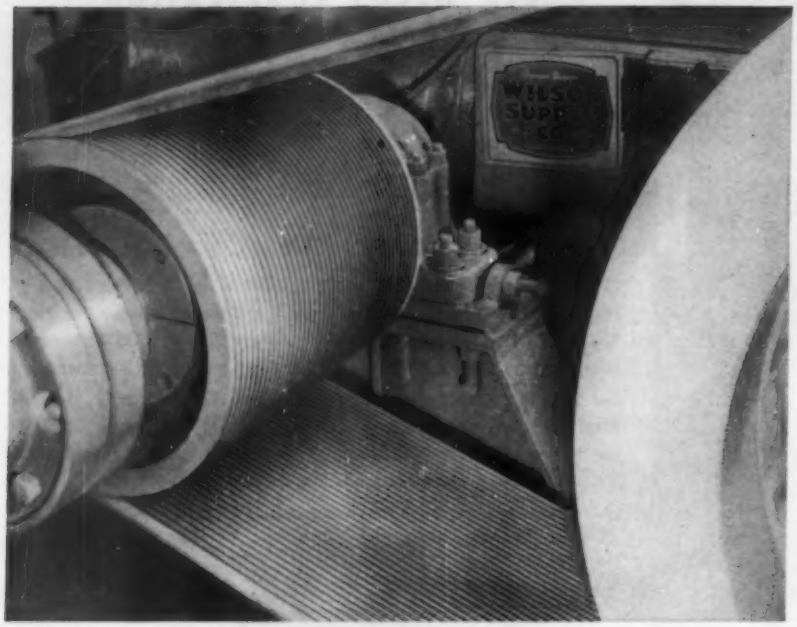


Write for complete price information and catalog.

Sold through Oil Field Suppliers.

A·B·CHANCE CO. CENTRALIA, MISSOURI TORONTO, ONTARIO, CANADA

Wherever oil men work, they depend on



When you change drives...
Don't Settle for *Less* than the BEST

CONVERT TO RELIABLE R/M POLY-V® DRIVE!

This oilfield compressor drive was rough on V-belts . . . until Wilson Supply Company installed trouble-proof R/M Poly-V Drives on all 200 HP units. Today, R/M's patented, space-saving transmission drive assures a degree of power-packed performance and dependability not possible with any available V-belt drive!

Major causes of V-drive trouble are engineered *out* of Poly-V Drive. It features a single unit, V-ribbed belt—*not* an assembly of V-belts that become unmatched and prevent complete power delivery. Full contact between Poly-V Belt ribs and specially designed sheave grooves keeps belt position constant . . . maintains groove shape and profile regardless of wear—with less wear on belt and sheaves even under toughest drive conditions! Speed ratio is unchanged. And because Poly-V Belt has uniform, uninterrupted strength member across the sheaves, Poly-V Drive will reliably deliver up to 50% *more* power in the same space as a multiple belt drive—or equal power in as little as ⅔ the space!

● ELIMINATES "MATCHING" PROBLEMS
A SINGLE UNIT across full width of sheave—NOT an assembly of SEVERAL V-BELTS
Poly-V
V-Belts
● MORE UNIFORM POWER
● IN LESS SPACE
Uninterrupted strength member full width of sheave provides higher horsepower capacity with less stretch —in less space.
PITCH LINE
PITCH LINE
NO CHANGE IN PL
FULL LOAD TO NO LOAD
● MAINTAINS GROOVE SHAPE
● COMPLETE CONTACT-PRESSURE
● MORE CONSTANT SPEED RATIO
Sheave grooves do not wear out of shape. Full and complete contact-pressure of rubber-to-sheave maintains groove profile. Maintains constant pitch and speed ratio.
..."MORE USE PER DOLLAR"

Let an R/M representative show you how Poly-V* Drive can give you more power delivery, more drive dependability . . . "More Use per Dollar" than the drive you now use. Just two cross sections of Poly-V Belt meet every heavy duty power requirement. Write for Bulletin M141.

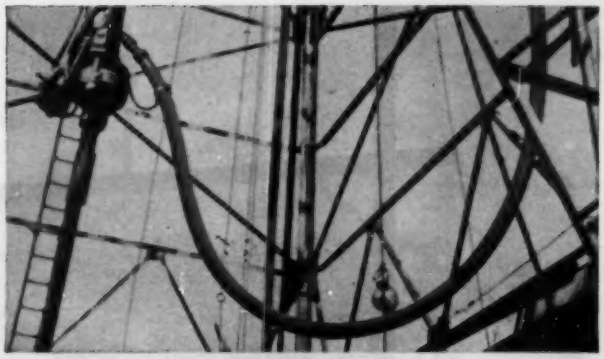
WHEN YOU CHANGE DRIVES...CONVERT TO R/M POLY-V DRIVE AND BE SURE!

*Poly-V is a registered Raybestos-Manhattan trademark.

OTHER RUBBER PRODUCTS FOR THE PETROLEUM INDUSTRY

MUD PUMP INTAKE HOSE • VIBRATION HOSE • SHIP AND BARGE LOADING HOSE • TANK TRUCK AND TANK CAR HOSE • PROPANE HOSE • FUEL OIL TRUCK HOSE • FIRE HOSE

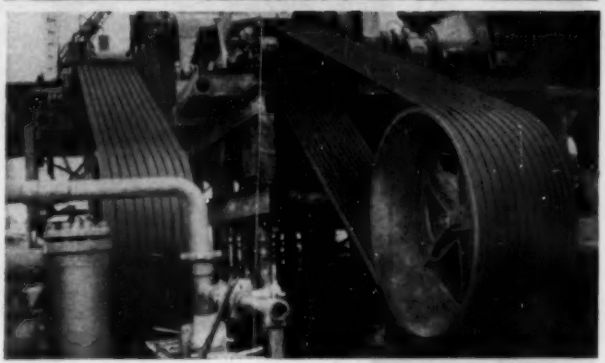
R/M Products



RAY-MAN ROTARY HOSE

Strong • Safe • Flexible

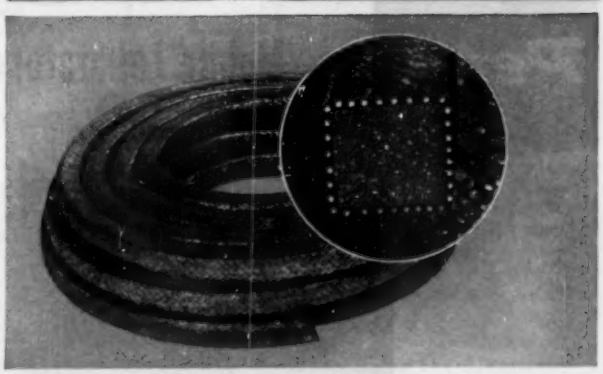
Special high-tensile steel cable wire reinforcement, precision wound under tension, gives Ray-Man CBL Rotary Hose unequalled strength and flexibility for safer, easier handling and make-up on the rig. Resists kinking and accidental crushing in transport . . . holds steadier in the derrick *without whipping*—even under high pressures of deep drilling. Streamlined, built-in coupling has no protruding lugs or flanges—features R/M leak-proof "Lip-Lok" seal that tightens under pressure to prevent blowouts! Write for Oilfield Hose Bulletin M651.



CONDOR LS V-BELTS

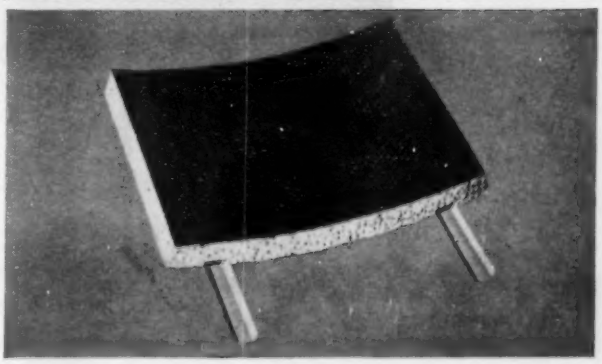
Length Stabilized

No whip, no wobble, no weave—no undue stress or V-belt turnover on long center, heavy duty oilfield drives! Condor LS V-Belts are *length stabilized* to give a degree of lateral and longitudinal stability *without stretch* never before possible. They're length *certified*, too . . . measured, tagged and vacuum packaged to assure positive length control and freshness from factory to field to drive . . . and they now transmit 40% more power than conventional V-belts at no increase in cost! Write for Bulletin M210.



R/M UNIVERSAL PLASTIC PACKING

Made of long-fiber asbestos, a special binder and non-frictional metal, it's the best to use for sealing on centrifugal pump shafts, valve stems, reciprocating rods, and other equipment. Designed specifically for use against gasoline, fuel oil, and other petroleum products. This packing is available in all standard sizes in increments of $\frac{1}{16}$ in., and can be had in both spiral and ring forms, butt or bevel cut.



RAY-MAN BRAKE BLOCKS

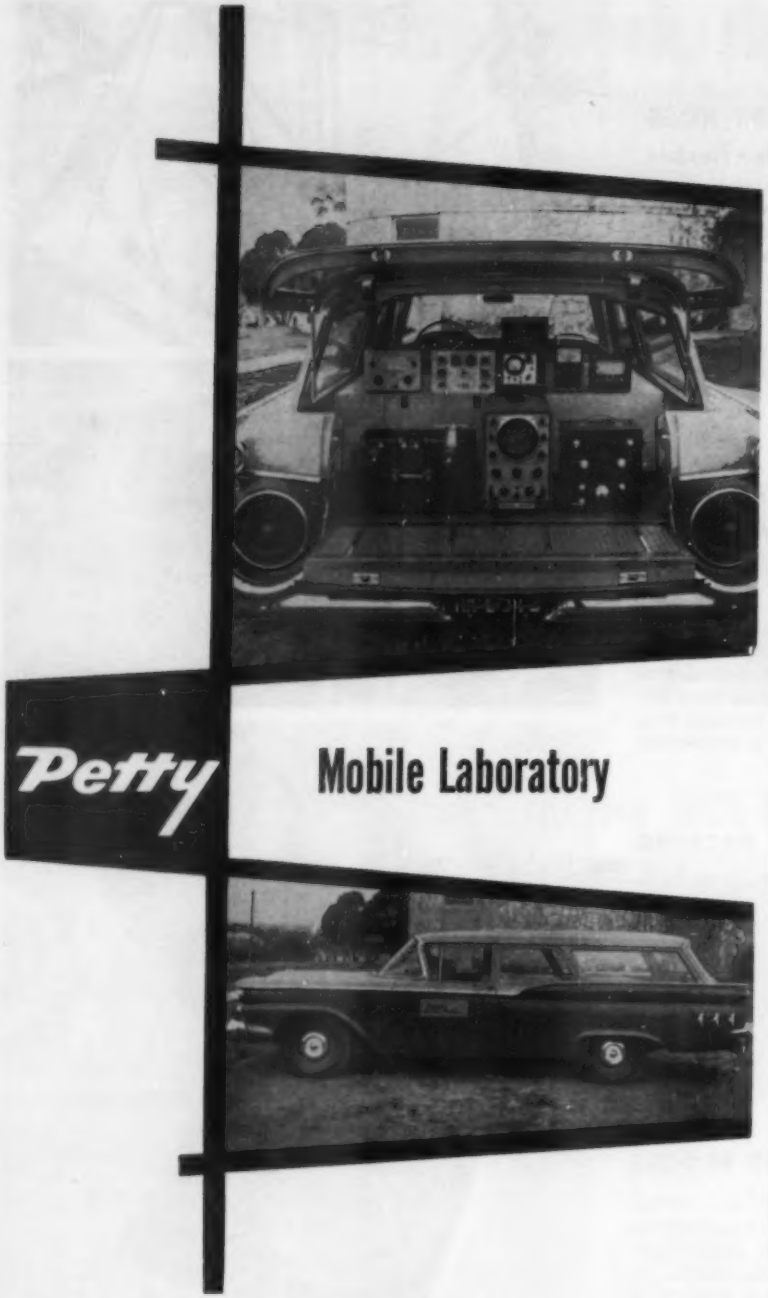
Long lasting Ray-Man 635-D Brake Blocks cost less because they wear longer. Made of extra-large asbestos yarns, special saturant, wire reinforced. Resist bleeding, won't glaze or carbonize. Ray-Man blocks are available in drilled or countersunk sets or in the R/M patented Key-Lok style. Patented key-lok gives more friction surface, blocks slide on and off to speed relining. Make hole faster. Cut cost with Ray-Man. Call your nearest R/M warehouse today or contact your closest authorized R/M oilfield equipment supply store located in major oil producing areas.

RM930

RAYBESTOS-MANHATTAN, INC.

PASSAIC, NEW JERSEY

Brake Lining and Blocks • Clutch Facings and Automatic Transmission Friction Parts • Conveyor and Power Transmission Belts Industrial Hose • Rubber Covered and Lined Equipment • Mechanical Packings and Gasket Materials • Asbestos Textiles • Engineered Plastics • Sintered Metal Products • Abrasive and Diamond Wheels • Industrial Adhesives • Laundry Pads and Covers • Bowling Balls



Petty
GEOPHYSICAL ENGINEERING CO.
TRANSIT TOWER SAN ANTONIO CApitol 6-1393

The Petty Mobile Laboratory takes laboratory test procedures to the field and insures Petty clients of optimum instrument performance at all times.

Foreign Experience Since 1927

NEVER CONTENT TO BE "AS GOOD AS"... ALWAYS STRIVING TO BE "BETTER THAN"

the oil industry's use of helicopters for off-shore purposes, had 30 Bell models before the recent order.

Republic Supply Co. announces

. . . the appointment of Tommie P. Nelms as manager of the new south Texas district. Nelms was employed by Republic as a floorman in 1945, and since has served as store manager, field salesman, and special district representative.

F. Roger Parks is elected v.p.

F. R. Parks

. . . in charge of the newly opened New York office of Continental Tube Co., an affiliate of Crispin Co., Houston. President Andre A. Crispin said the New York office primarily will serve U. S. oil companies which have offices and operations abroad.

Before coming to Continental, Parks was regional representative of the export section of Reed Roller Bit Co. in New York.

Hammond A. Helms is elected

H. A. Helms

. . . vice president and general manager of Baash-Ross Division of Joy Mfg. Co. He succeeds G. D. Johnson who continues as a consultant to the company.

Helms, who has been associated with oil-field equipment 17 years, comes to Joy from Chance Vought Aircraft, Inc., where he was controller and a member of the executive committee. Before joining Chance Vought, he served in the Security Engineering Division of Dresser Industries.

Okonite Co. appoints two

. . . new district managers. James R. Haden takes over in the newly designated Kansas City district office and Thomas M. Brickley, Jr. heads the newly created district office in Milwaukee.

Haden, a 9-year Okonite employe, has operated his office since 1954, while it was a branch of the St. Louis district. Brickley previously was with

It couldn't be done without the RUBBER SLEEVE Core Barrel

Complete core recovery, even in soft, unconsolidated or fractured formations

Just over a year ago, Christensen Diamond Products Company introduced an entirely new concept in core packaging to the oil industry . . . the Rubber Sleeve Core Barrel.

Since that time, many formations that were formerly difficult or impossible to core, have been cored successfully with the rubber sleeve core barrel.

This rubber sleeve barrel actually encases the core in a protective rubber package, which reduces contamination to a minimum and eliminates many of the bridging, crumbling and jamming problems encountered with conventional barrels.

The rubber-packaged cores are ideal for handling and shipping and can be easily stored without altering the physical or fluid content, thus eliminating the need for freezing or canning of cores.

And now, laboratories have developed techniques which enable them to obtain accurate reservoir information without removing the core from the rubber sleeve, even with softest formations.

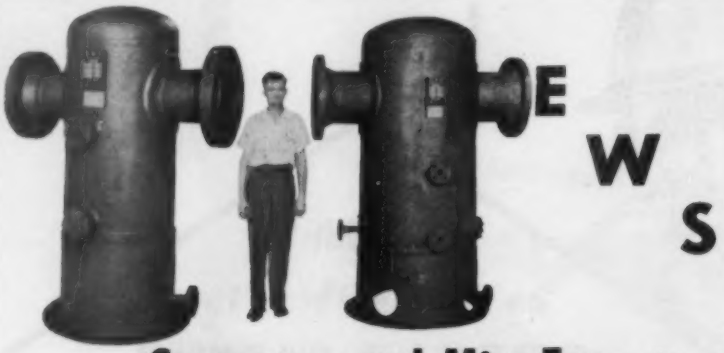
If your problem is poor core recovery, call Christensen, and learn how you can get "good" cores at "Less Cost Per Foot."

Diamonds Mean, "Less cost per foot."

CHRISTENSEN DIAMOND PRODUCTS

1937 SOUTH SECOND WEST • SALT LAKE CITY, UTAH

For more detailed information and case histories on the Rubber Sleeve Core Barrel, or any of Christensen's complete line of conventional and wireline core barrels, write or call Christensen Diamond Products Company.



E W S

Separators and Mist Extractors

Mean extra recovery and protection needed in Refinery and Chemical Plant operation.

Various sizes, capacities may be calculated to meet each requirement. Stainless steel and removable names optional.

E-W-S HIGH PRESSURE LINE SEPARATORS

Injection Well Separator for repressuring operation, 5,000 lb. working pressure. Various capacities available, beveled for welding or flanged connections.

Ed. W. Smith Machine Works

113 Murray St. RI 1-3941 Dallas, Texas

P&H "PROFIT-YARDS"

VERSATILE 10-TON P&H MITI-MITE FOR TRENCHING, DIGGING BELL-HOLES, LOADING AND UNLOADING PIPE

Profit-Yards are the end product of advanced P&H design and engineering features that result in higher production, lower operating cost—*more net profit* for P&H users. Truck cranes from 10 to 80 tons—crawler cranes from 20 to 110 tons—crawler excavators from ½ to 3½ cu. yds. See your P&H dealer for all of the profitable facts or write: Dept. 539A, Harnischfeger Corporation, Milwaukee 46, Wisconsin.

HARNISCHFEGER

Brickley & Co., manufacturers' agent, in Milwaukee.

Carl J. Maki fills new Dresser

Carl Maki

. . . post—assistant to the executive vice president, announces J. B. O'Connor, Dresser president.

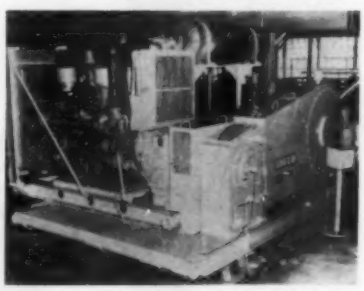
Maki comes from The Texas Co., where he was assistant to the manager of the gas division. Before that he was with Seaboard Oil Co. as gas-department manager until the company merged with The Texas Co. last year. Maki has also worked for Gulf Oil, Mene Grande, and Phillips Petroleum.

In his new post, Maki will work on engineering developments in gas applications. He will report to John Lawrence, Dresser executive vice president.

Bob R. Neal becomes president

B. R. Neal

. . . of Harley Sales Co., Tulsa oil-field distributor of Wisconsin Motor Corp., Milwaukee. Neal previously was chief engineer and sales manager at Harley.

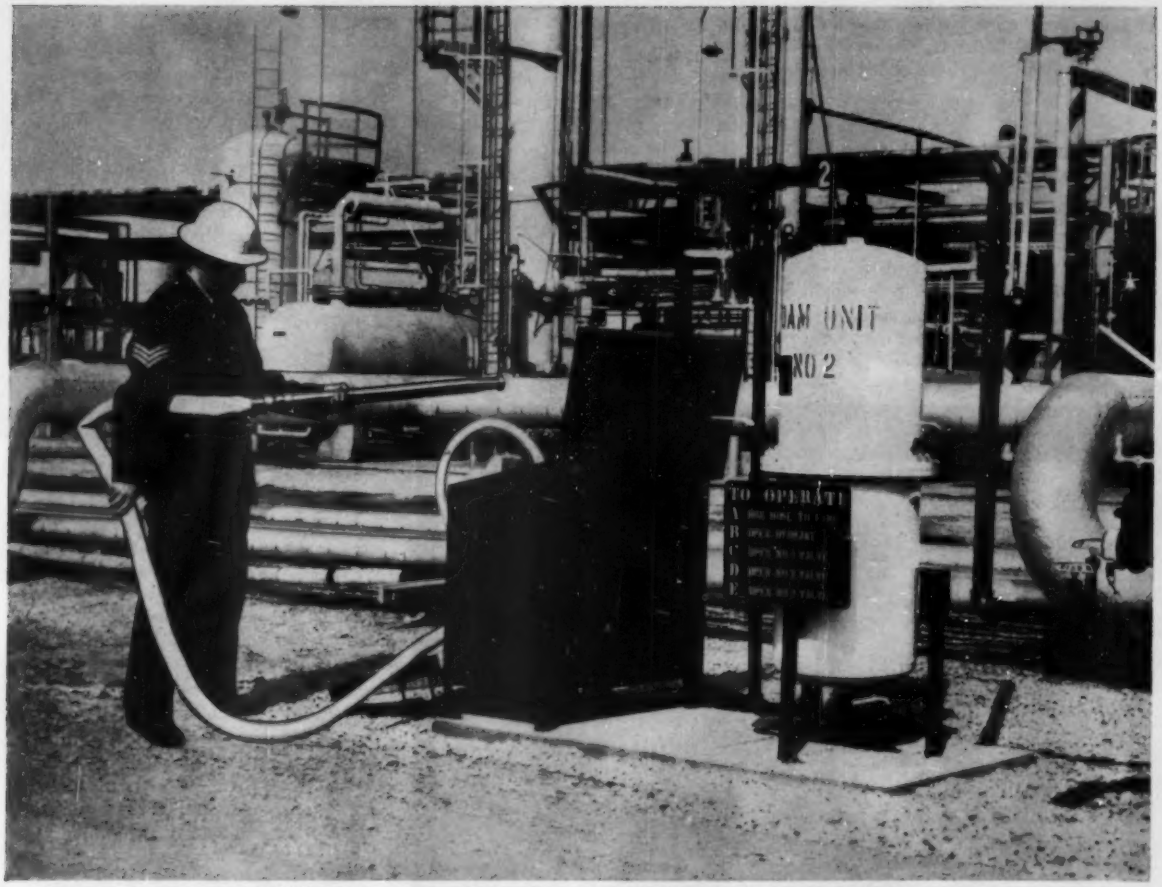


Venezuela-bound power unit

. . . built by Hercules Motor Corp. is incorporated in a specially designed Ideco, Inc. independent pump drive. The model is being readied for shipment to Mene Grande Oil Co. in Venezuela.

The Hall-Scott power unit, which operates on gasoline, natural gas, or LPG, is a V-12 model designed for industrial applications where high horsepower with low engine weight is desired. It can be truck-mounted conveniently because of the low weight-to-horsepower ratio, the manufacturer points out.

The unit develops 550 hp. at 1,800



No larger than a man, this ROCKWOOD Balanced Pressure Proportioning System (white tank, center) has plenty of fire-fighting capacity! Unit's 50-gal. tank of ROCKWOOD Double-Strength FOAM liquid provides 12,000 gals. of expanded FOAM in 25 min. Accurate FOAM liquid injection rate for ROCKWOOD FOAM Nozzle is automatically assured over wide flow range.

This hose station really packs a punch!

...Delivers 480 gals. ROCKWOOD FOAM per minute

Almost ½ hr. of expanded FOAM . . . at 480 gals. per minute . . . a total of 14,400 gallons of expanded FOAM! That's the potent fire-killing coverage Canadian Oil Refinery gets from its ROCKWOOD-equipped hose stations. And FOAM liquid injection rates remain accurate to the last minute!

In these extra-capacity units, ROCKWOOD Balanced Pressure Proportioning System *automatically* assures proper injection of FOAM liquid regardless of variations in rate of flow. Utilizing hydrant pressure, it precisely proportions FOAM liquid into the water line with little or no loss of supply pressure. Advanced diaphragm design provides positive separation of FOAM liquid and water . . . eliminates all danger of premature mixing. Operation is smooth and trouble-free under all conditions.

Equally important to its superior performance is the ROCKWOOD Double-Strength (3%) FOAM liquid used in this system. It provides real FOAM-making ability and economy. As normally used (3 parts to 97 parts water) it cuts transportation costs and storage space in half . . . costs less for equal coverage.

ROCKWOOD FOAM Systems give industrial and refinery hose stations maximum fire-fighting efficiency . . . reduce cost and operator attention to a minimum. Find out how ROCKWOOD can increase *your* margin of protection. Tested and listed by Underwriters' Laboratories, Inc.

ROCKWOOD SPRINKLER COMPANY
Engineers Water...to Cut Fire Losses
Distributors in all principal cities

ROCKWOOD SPRINKLER COMPANY
Portable Fire Protection Division
1291 Harlow Street
Worcester 5, Massachusetts

Please send me details on ROCKWOOD Balanced Pressure Proportioning System for industrial and refinery hose stations.

Name .....
Title .....
Company .....
Street .....
City .....*Zone*....*State*.....

r.p.m. on butane or gasoline, and 450 hp. with natural gas. It weighs 6,700 lb., complete with radiator and power takeoff.

PESA represented in 120 booths

. . . and exhibit buildings at the recent International Petroleum Exposition in Tulsa, the association reported. H. R. Safford, Jr., executive secretary of the Petroleum Equipment Suppliers Assn., noted that the group was in that many booths as a result of the large number of members who participated in the exposition.

Schlumberger reports changes

. . . in its location manager personnel. T. W. Cobb has been promoted to location manager at Venice, La.; H. H. Ham, former location manager at Venice, will take over management of the location in Laurel, Miss.

L. A. Braswell has been transferred from Wichita to Hays, Kans. J. D. Austin has been moved from Great Bend, Kans. to Evansville, Ind. R. S. Judson, former senior sales engineer at the Gulf Coast Division of Schlumberger Well Surveying Corp., has been assigned location manager at Wharton, Tex. R. M. Porter takes over at Kenmare, N. D.

The company also announced appointments and reassignments of the following sales engineers: W. R. Laws, at Midland, Tex.; R. R. Vann, Hobbs, N. M.; F. E. Kendrick, from Shreveport to Laurel, Miss.; B. E. Davis, Cushing, Okla.; and J. D. Cunningham, Gretna to Venice, La.

Promotions to senior sales engineers were given to R. C. Cantrell, New Orleans, and J. A. Gilreath, Jackson, Miss.

Geophysical Service appoints

. . . two vice presidents and two managers, announces R. C. Dunlap, Jr., president of the Dallas petroleum-exploration firm.

N. W. Mann has been named vice president in charge of U. S. and Canadian operations, the position held by Dunlap prior to his recent appointment to president. Mann was formerly manager of western U. S. operations.

G. J. Kohler, Jr., 24-year company veteran who has been manager of GSI operations in Latin America since September, 1957, has been elected vice president in charge of that area.

Ray H. Wright, who has been serving as manager of GSI's Canadian operations, will move to Dallas to take over the position vacated by Mann. Wright, in turn, will be succeeded in Canada by Dan F. Brennan.

Tysco design, engineering, sales, and service departments operate on the basis that quality products and dependable service establish satisfied customers. To assure that its products and service are the best available, Tysco functions as a flexible company. One that easily adapts its facilities and personnel to your specific oil and gas process equipment problems. A company that delivers sound, economical solutions to those problems. When you specify Tysco process equipment, you are sure that each unit, from the smallest component to the major vessel, is designed, manufactured, installed, and serviced to help you get more from each process equipment dollar.

TYSCO TYSON SMITH CO. ONE OF THE SMITH INDUSTRIES

8000 Hempstead Highway • Houston, Texas

SERVING INDUSTRY WITH QUALITY PRODUCTS, DEPENDABLE SERVICE

Hale Instruments turns over

. . . a second Omnitape magnetic media-transcribing system to Robert H. Ray Co. for use in Libya. Otis Lee Hale (left) makes the transaction with Don Melton, laboratory director for Robert H. Ray Co. Ray has one Omnitape already in operation in Iraq.

The new system features a headbank assembly which permits transcriptions from uniquely configured tapes to standard-spread media. The method greatly increases the system's production capacity.

23,400

25,340

THE WORLD'S DEEPEST WELLS –

Forever Recorded in Petroleum History – Logged and Perforated by Schlumberger

Schlumberger is proud to have been called for both logging and perforating the World's Deepest Well, the Phillips Petroleum Company, No. 1 University "EE." Record-breaking, open-hole logs included the Electrical Log, Microlog, Gamma Ray-Neutron Log, and Dipmeter Survey. In the deepest perforating operation ever performed, Schlumberger made 24 successful shaped-charge runs out of 25—firing 1420 shots from 24,967 feet to 25,322 feet. Bottom-hole temperature: 360°F. Bottom-hole pressure: approximately 15,000 pounds.

These operations followed Schlumberger's successful logging and perforating of the previous record-depth well, the Phillips Petroleum Company, Montgomery "A" No. 1 in the same area. The Montgomery "A" No. 1 was drilled to 23,400 feet.

The confidence of the industry in the ability of Schlumberger to meet advancing requirements is shown by the fact that Schlumberger has logged every record-depth well since 1934.

THE EYES OF THE OIL INDUSTRY®

SCHLUMBERGER

LARKIN FILRITE CEMENTING EQUIPMENT

For automatically filling the casing from the bottom while casing is being run.

The prime functions of Larkin Filrite Cementing Equipment are:

1. To eliminate the "piston-effect" of pressure surges which occur when closed-end casing is being lowered. This reduces the hazard of breaking down weaker formations.

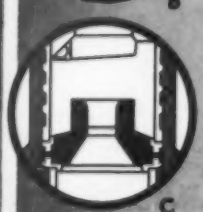
2. To speed up the casing run by eliminating time-consuming surface fill-up of the casing. Uninterrupted lowering of the casing reduces the possibility of casing becoming stuck before reaching bottom.

A

Circle A, a view 90° from that of the large illustration, shows the Filrite valve in running-in position. The resilient diaphragm valve remains closed until the differential fluid pressure across it overcomes its inherent resistance to open.

B

Circle B shows the rubber diaphragm inverted by pump pressure as the well is being cemented. Filrite is full opening and will allow passage of a bridging to actuate other equipment which might be installed on the casing beneath a Filrite Collar.



C

Circle C shows the spring-loaded flapper valve in closed position after being released by inversion of the diaphragm. The flapper valve in the Larkin Filrite equipment is very strong and has no depth limitations.

Available but not illustrated:

Filrite Collar, Filrite Geyser Shoe and Filrite Geyser Collar

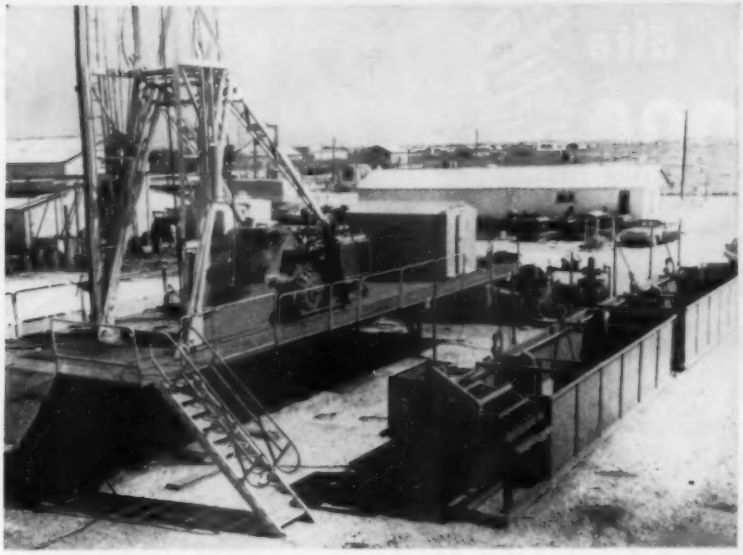
LARKIN

...Through Your Supply Store

LARKIN PACKER COMPANY, INC.

WAXAHACHIE, TEXAS

LARKIN LEADERSHIP HAS BEEN EARNED BY YEARS OF DEPENDABLE PERFORMANCE



SLIM-HOLE RIG has Emsco 250 draw works, torque-converter drive powered with a 671 twin GM diesel. Rig is mounted on Lee C. Moore 97-ft. 350,000-lb.-capacity dual trailer mast.

Bolivia gets lightweight rig

PARKER DRILLING CO. of Tulsa has recently shipped a specially designed lightweight slim-hole drilling rig to Bolivia for the Bolivian Gulf Oil Co.

This rig, along with a National 130 rig, will be operated by Parker for Gulf. The slim-hole rig was specifically designed to meet the restricting requirements of light roads, a narrow-gage railway, and limited-width tunnels in South America. The component parts can be broken down for ease of mobility.

The rig was assembled at Odessa, Tex., in Parker's yard, then shipped to Houston where it was crated for transport by boat to Buenos Aires, Argentina. It will then travel overland by narrow-gage railway to the southeastern sector of Bolivia. Rig personnel were specially trained for the operation in the phases of drilling and production work, mud schooling, rig building, cementing procedures, drill-stem testing, welding, truck driving, administration, and field safety.

The slim-hole rig consists of an Emsco 250 draw works with torque-converter drive powered with a 671 twin General Motors diesel. The rig is mounted on a Lee C. Moore 97-ft., 350,000-lb.-capacity dual trailer mast. A dual was selected so that the loads could be broken down for travel over rough roads. Two Emsco 7½ by 14-in. pumps were selected for their light weight. They are each powered by a 671 twin General Motors diesel so that inventories for pump parts and motors could be greatly reduced and all parts could be interchanged. Each component of the rig was rigged up as compactly as possible to keep the width and height within the maximum limits allowed by the tunnels of that country. The motors on the pumps were staggered 6 ft. to obtain greater cooling capacity. All mud lines are mounted permanently on pumps and trailers to facilitate fast rig up. Each item of the rig was unitized to the extent that the only tool needed to rig up the pumps and mud lines is a hammer for the unions.

The stand pipe is 4½-in. drill pipe with a specially-designed gooseneck to hold the rotary hose away from the derrick. The rig was equipped with two steel pits, 7 by 30 by 5 in. with swing jets. One of the pits has a shale shaker permanently mounted on it. Blowout-preventer controls consist of conventional controls plus an accumulator with remote switch stations. The rig is equipped with a 36-in. single hydromatic brake and a maximum of 7 ft. substructure. Other component parts of the rig are designed to drill approximately 7,000 ft. with a 6½-in. hole. The entire design of the rig stresses light weight and simplicity so that its continuous operation and maintenance in the remote areas of Bolivia can be assured.

It's New!

NOW–AT LAST A MEASURING WHEEL THAT MEASURES ACCURATELY TO A FRACTION OF AN INCH!

Rolatape's amazing new Model 415 meets all your measuring needs — measuring quickly and surely over the most uneven and irregular terrain with no risk of human error. This time-saving instrument is calibrated to measure accurately in full view of operator as it is rolled along, giving measurements in inches (to ½ inch) on one side of measuring wheel, and tenths of a foot (to .5 of a foot) on the other. Sturdy and lightweight, it is equipped with automatic brake and built-in stand. Handle folds compactly. See one at your dealer's today.

MEASURES ACCURATELY ON IRREGULAR SURFACES

SEND TODAY FOR FULL DETAILS

ROLATAPE Inc.
1741 14th Street,
Santa Monica, Calif.

Send me free details on ROLATAPE:

NAME_____

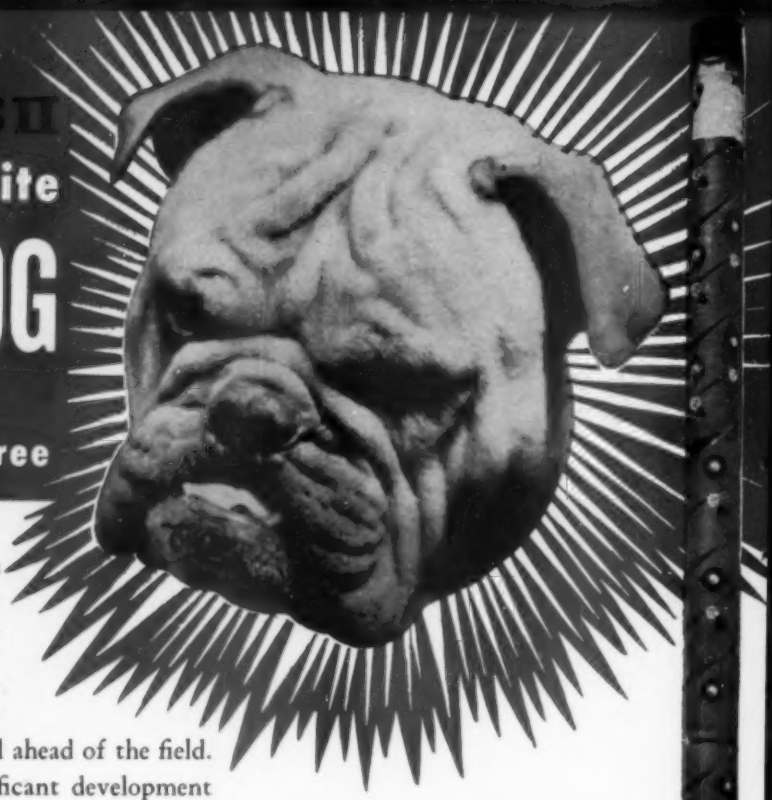
FIRM_____

ADDRESS_____

CITY, STATE_____

Now—PGAC'S ATLAS II with Deeper Bite is the ATLAS BULLDOG

. . . the Bullet Gun with an Enviable Pedigree



For the past 12 years leading operators have called PGAC's Atlas and Atlas II bullet guns the Oil Industry's *safest and most powerful bullet perforators.* PGAC's research improved these guns year after year and kept them always well ahead of the field.

Now, as the result of another significant development *—a new powder which increases penetration 70% over that of even the Atlas II*—PGAC hereafter designates this more powerful bullet gun as the "Atlas BULLDOG."

The Atlas BULLDOG retains all of the basic features and outstanding advantages of the Atlas and Atlas II guns.

That's why the Atlas BULLDOG now packs everything its famous forerunners had—*plus 70% more penetration!* "Get with" the Atlas BULLDOG today. You'll really go for this pedigreed champion of bullet guns!

Unretouched photo (lower left) shows the remarkable bullet penetration of over 9" from a 4" O.D. Atlas BULLDOG gun, typical of several test shots *fired under 2500 p.s.i. hydrostatic pressure at 180°F.* Tests with 5-7/16" O.D. Atlas BULLDOG guns produced much deeper bullet penetrations.

The targets were constructed *by a Major Oil Company,* and all tests were conducted recently *under their complete control.*

All targets had 7/16"-thick endplates (from flattened 9⅝" O.D., 43-lb., #N-80 casing) welded to 6⅝" O.D. pipe. Neat cement was cured seven days under water at 160°-180°F. and tested to a tensile strength averaging over 500 p.s.i.

Write today for further information

PGAC-584

PERFORATING GUNS ATLAS CORPORATION

CHEMETRON

P G A C OIL WELL SERVICES

General Offices and Main Plant: 7730 Scott Street, Houston 21, Texas—Phone REpublic 4-1651

TEXAS: Alice — Beaumont — Bridgeport — Colorado City — Corpus Christi — Crane — Dallas — Houston — Longview — Midland — Monahans — Odessa — Pampa — Victoria — Wichita Falls. NEW MEXICO: Farmington — Hobbs. OKLAHOMA: Oklahoma City — Pauls Valley — Perry — Woodward. ARKANSAS: Magnolia. MISSISSIPPI: Laurel. LOUISIANA: Buras — Houma — Lafayette — Lake Charles — New Orleans — Shreveport. KANSAS: Great Bend—Liberal.

PGAC's SUBSIDIARY COMPANIES — CANADA — Perforating Guns Of Canada, Ltd. VENEZUELA and BOLIVIA — Servicios Tecnicos Atlas, C.A. GERMANY — Atlas Deutsch-Amerikanische Olfelddienst, G.m.b.H. U.S.A. — PGAC Development Company

EARLY REPORTS of oil success at Grand Saline salt dome had East Texas aroused last week. But excitement over the strike waned quickly when swab tests recovered only 3 gal. of heavy black tar.

East Texas prospect sputters . . . and dies

BY FRANK J. GARDNER

EAST TEXAS QUIVERED with excitement last week . . . for a day or two. Shell Oil Co. was about to complete a new discovery that would add the fifth piercement salt dome to the list of commercial domes in that region. But week-end testing of the well brewed only some tar and a lot of disappointment.

A sure thing fails . . . Shell's 1 Persons, ½ mile southeast of Grand Saline townsite in northeastern Van Zandt County, was the wildcat in question. Reports had it that commercial oil shows had been found in the upper part of the Woodbine sand at 3,485-3,505, 3,682-3,702, 3,970-90, and 4,310-24 ft. The operator had moved off the drilling rig and was moving in a completion rig. Shell wasn't talking, but the townspeople of Grand Saline were. Discovery was assumed to be a sure thing. At least three applications to drill within the townsite were filed with the Railroad Commission of Texas.

Then luck lowered the boom. The perforations at 3,485-3,505 ft., considered to be the best bet for production, were tested. Swab recovery totaled 3 gal. of heavy black tar. At last report, the well hadn't been plugged, but failure was as imminent as success had been the week before.

On a prime target . . . This near-hit, however, is one more encouraging advance in the East Texans' assault on the 18 piercement salt domes within their bailiwick. Since 1956, when British American Oil Producing Co. met success at the Hainesville dome in Wood County, and Texaco did a repeat performance on the Bethel dome in Anderson County, these 18 domes have been transformed from "hopeless prospects" into prime targets. This showing at Grand Saline is ample evidence that there's oil to be found there, and it will be.

These domes have a checkered history. Ever since 1891, when E. T. Dumble first described six of them from surface observation, they've been an enigma to oil hunters. The first one to yield any oil was Boggy Creek dome in Anderson County; Humble Oil & Refining Co. brought it into production in 1927, and launched an active dome play which lasted until 1932. In that entire time, no other discoveries were made, and interest in the domes died completely.

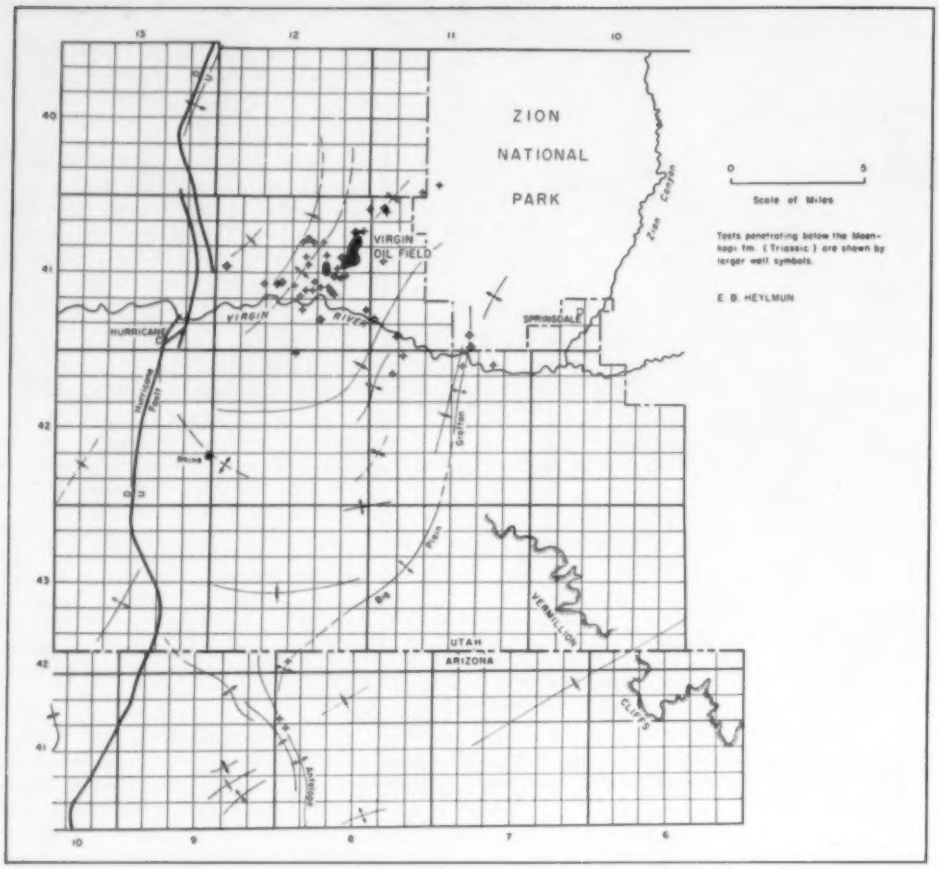
In 1942, Magnolia Petroleum Co. found short-lived production on the Concord dome, also in Anderson County; this one produced for less than a year and was abandoned.

For 14 years, the domes were crossed off the prospect list of East Texas wildcatters. But when BA hit at Hainesville in 1956, a wave of heavy leasing swept across all East Texas, North Louisiana, and down into the interior salt basin of southern Mississippi.

But interpretation is the key . . . Since Hainesville, Bethel dome (Anderson County) and Oakwood dome (Freestone County) have been brought into production. In every case, success has hinged on correct interpretation of the salt overhang and its effect on oil trapping (OGJ, May 4, 1959, p. 143). Precise geophysical interpretation was credited for the Hainesville success, and it played a major role in the other two discoveries. Obviously, Shell is using the same approach at Grand Saline. The 1 Persons drilled through the overhang into the underlying Cretaceous section and back into the salt stock. The hole was sidetracked and drilled to total depth 4,927 ft. in Buda-Lower Cretaceous limestone.

The 14 "dry" domes in East Texas, plus 15 more in North Louisiana and 55 in the Mississippi salt basin, are a direct challenge to the oil finder. There's enough work here to keep the geophysicist and subsurface geologist busy for decades to come. Many of the domes have been drilled, but most of this drilling has clustered on the tops of the domes, not on the flanks.

How, in the light of events at Hainesville, Bethel, Oakwood, and Minden in North Louisiana, can these structures be ignored? There'll be lots of tar and lots of disappointment along the way, but we predict that in the next 20 years, most of these 84 domes will come into the producing column. Rest assured, Shell hasn't given up at Grand Saline. It will be next on the list of producers.



Southern Utah . . .

Green field for wildcatters?

BY EDGAR B. HEYLMUN
Consulting Geologist, Salt Lake City

THE GREATER VIRGIN REGION of southern Utah includes some of the most spectacular desert scenery in the United States, but its oil potential is little known.

The area lies between the great Hurricane fault on the west and Zion National Park on the east, and encompasses approximately 350 sq. miles. Most of the region is in the public domain.

The old Virgin oil field—the oldest in Utah—lies in the heart of the region. Since the first drilling was done in 1907, approximately 140 wells, mostly shallow, have been drilled, and about 30 have been productive.

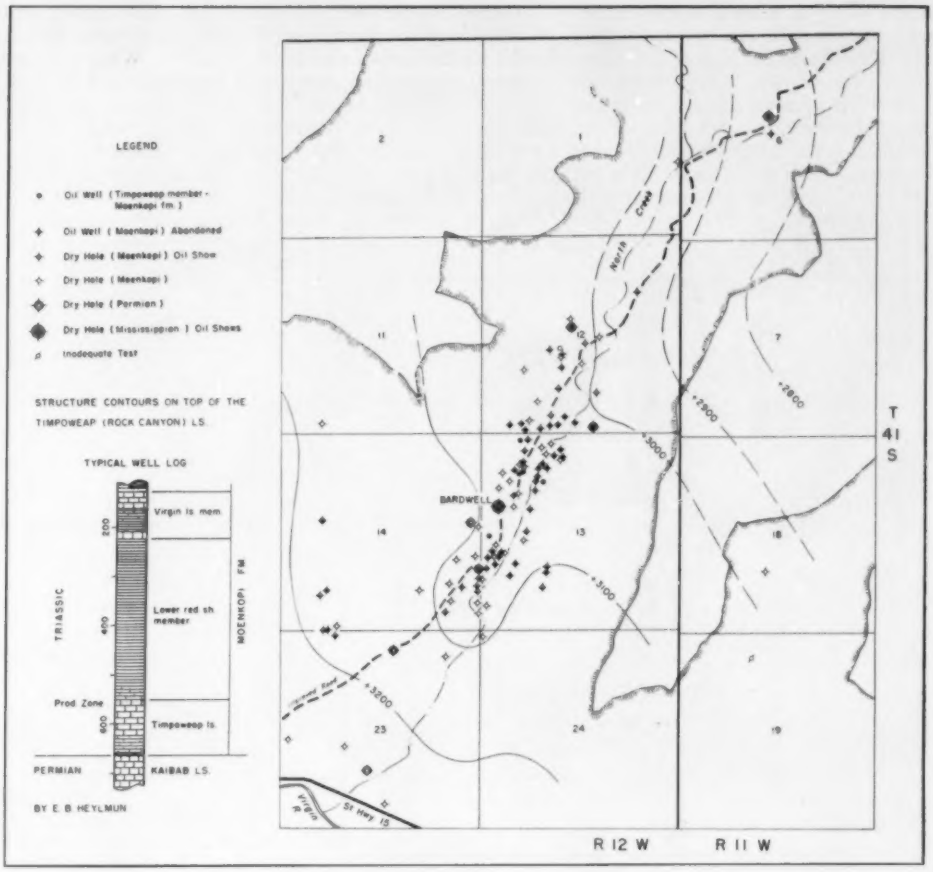
A number of oil seeps in the area prompted the first test. The average depth of the producing zone is around 600 ft. It is sandy limestone between 1 and 8 ft. thick at the top of the Timpoweap or Rock Canyon, member of the Triassic-Moenkopi formation. The gravity of the oil ranges between 24° and 42° API, with an average around 32°. Only 480 acres have been proved productive, and the cumulative production from the field since 1907 has been only 193,000 bbl.

Production has been sporadic inasmuch as the field, to date, has been subcommercial. There is no record, however, of the wells ever having been subjected to modern fracturing treatment. Some wells had initial production figures in excess of 30 bbl. per day, so it is possible that sustained production could be obtained if the wells were properly completed.

Furthermore, the potential of the petroliferous Kaibab limestone of Permian age, underlying the Timpoweap, has not been fully exploited in the region. Some of the deeper zones hold promise too. There has been a comparatively small amount of deep drilling, yet virtually all horizons are within reasonable drilling depths.

Few deep tests . . . The E. R. Bardwell 1 Vinton, 13-41s-12w, Washington County, Utah, is the only important deep test within Virgin field proper. This well, drilled in 1958, went to a total depth of 4,538 ft., and bottomed in beds of Mississippian age. Aside from the expected oil shows in the Timpoweap and Kaibab, good shows were reported in zones at the base of the Permian-Pakoon formation and near the top of the Pennsylvanian-Callville limestone.

Rhine Petroleum is currently drilling in 25-42s-13w, Washington Coun-



VIRGIN oil field in Washington County, southern Utah, is the state's oldest field.

ty, and oil shows have been reported in the Pakoon. These two wells are the only tests to penetrate below the late Permian formations.

A shallow test drilled in 3-42s-12w, south of the Virgin field, reportedly encountered a flow of carbon dioxide gas along with shows of oil in the Timpoweap member of the Moenkopi formation. Inflammable gas has not been encountered in quantity in any wells drilled in the region.

Undrilled structures . . . As may be seen on the accompanying map, there are a number of anticlinal and synclinal trends in the region. Most of these features are very broad, have low structural relief, and are relatively inconspicuous. A few, like the Grafton anticline, are more pronounced. Aside from the Hurricane fault, which has had recent movement, there are only a few faults of consequence elsewhere. As may be noted on the map, many of the structures in the region have not been drilled.

Detailed subsurface mapping indicates that Virgin field lies in a synclinal sag near the crest of a broad regional nose. The best wells in the field appear to be those that are structurally the lowest. Since the producing zone at Virgin field is exposed along the Virgin River, only 2 miles to the southwest in an updip direction, it is possible that much of the reservoir pressure has dissipated and the oil has drained into synclinal pockets along the anticlinal trend. The Virgin field is, in essence, a type of subsurface oil seep.

About the author:

Edgar B. Heylmun has spent most of his professional career in mountain country. From 1949 to 1954, he was field and subsurface geologist with General Petroleum Corp. in the intermountain area and in California. He joined Pubco Petroleum Corp. in Casper as district manager in 1954 and was in charge of operations in Wyoming and Montana. Since 1957 he has been a consulting geologist in Salt Lake City, specializing in Utah and Rocky Mountain geology.

Shallow oil accumulations probably exist elsewhere in the region. Many of the shallow tests drilled outside of Virgin field recorded oil shows, usually in the Timpoweap or Kaibab. Good oil shows have been reported at shallow depths in wells drilled on the Antelope Springs anticline in northern Arizona, south of the area covered here, in the same zones that produce at the Virgin field.

The shallow possibilities, along with the prospects for deeper production, make the greater Virgin area attractive for future oil production. Adding to the luster of the area is the fact that it is on a shelf marginal to the great Cordilleran geosyncline to the west, hence stratigraphic changes in the subsurface should be numerous and varied. It is known that the late Paleozoic history in this region is complex, giving rise to many stratigraphic changes that could be interesting from the standpoint of oil or gas accumulations.

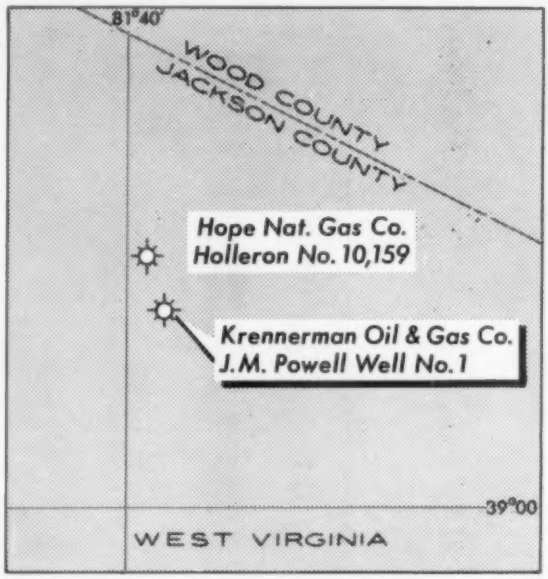
Markets needed . . . One of the factors that has held back development in the region has been the chronic market problem. Much of the oil produced at Virgin field has been re-

fined locally at a small topping plant, and marketed in nearby towns. The nearest oil pipeline is over 100 miles away in Arizona, and the nearest railroad is 55 miles away. It is understood, however, that the local market can handle the existing production and that the operations at Virgin field can be profitable if an adequate price is paid for the oil.

Despite the fact that the country is characterized by sheer, colorful cliffs and deep canyons, accessibility is not a significant problem except in a few places. To the north and northeast of the Virgin field there might be problems, as there would be elsewhere in the vicinity of the Belted and Vermillion Cliffs. Most of the region, however, consists of broad benches and prairie lands that are largely accessible by existing roads.

Winters are mild and summers are hot and dry, so the greater Virgin area is accessible to the drilling rig at almost any time. By weighing the advantages against the disadvantages, the wildcatter who's looking for shallow oil should give serious consideration to southern Utah.

A FOURTH GAS WELL was added to a promising West Virginia shallow area in Nicholas County.



ORISKANY gas production in a new Jackson County area gives West Virginia's exploration added zest.

West Virginia play quickens

Nicholas County

A SHALLOW GAS FIELD in Nicholas County, West Virginia, got another producer.

Hope Natural Gas Co. completed 10226-S. T. Moore, Nicholas County 224 at total depth of 1,870 ft. Flow was 7,234 M.c.f.d. through 7-in. production string (although Hope is contemplating running string of 2⅜-in. tubing to be used as a siphon due to the well making considerable water).

This new well is producing from Blue Monday sand of Mississippian age. Locally, this sand is known as the Edray sand. Rock pressure measured 1,520 psi. in 24 hours. This is Hope's fourth well in this field. Openflow potential of the field is 26,029 M.c.f.d.

There are only two dry holes in the field. Hope drilled one, and Sparks Gas Co. drilled the other. The Sparks well offset Hope's well No. 10212 about 1,400 ft. due west. This tends to limit the west boundary of the field, but it cannot be determined yet what the field's potential is until more tests are completed. United Producing Co., Inc. is drilling one such well now. It is the 2764 Gaymont Fuel Co., drilling at 2,215 ft.

Upon completion of this well, a more accurate boundary of the southern structure can be decided. Hope has staked 10238 C. F. Hammond No. 1. When this one is completed, it will help determine the east boundary (see attached map). Local operators are very optimistic about this shallow production.

Jackson County

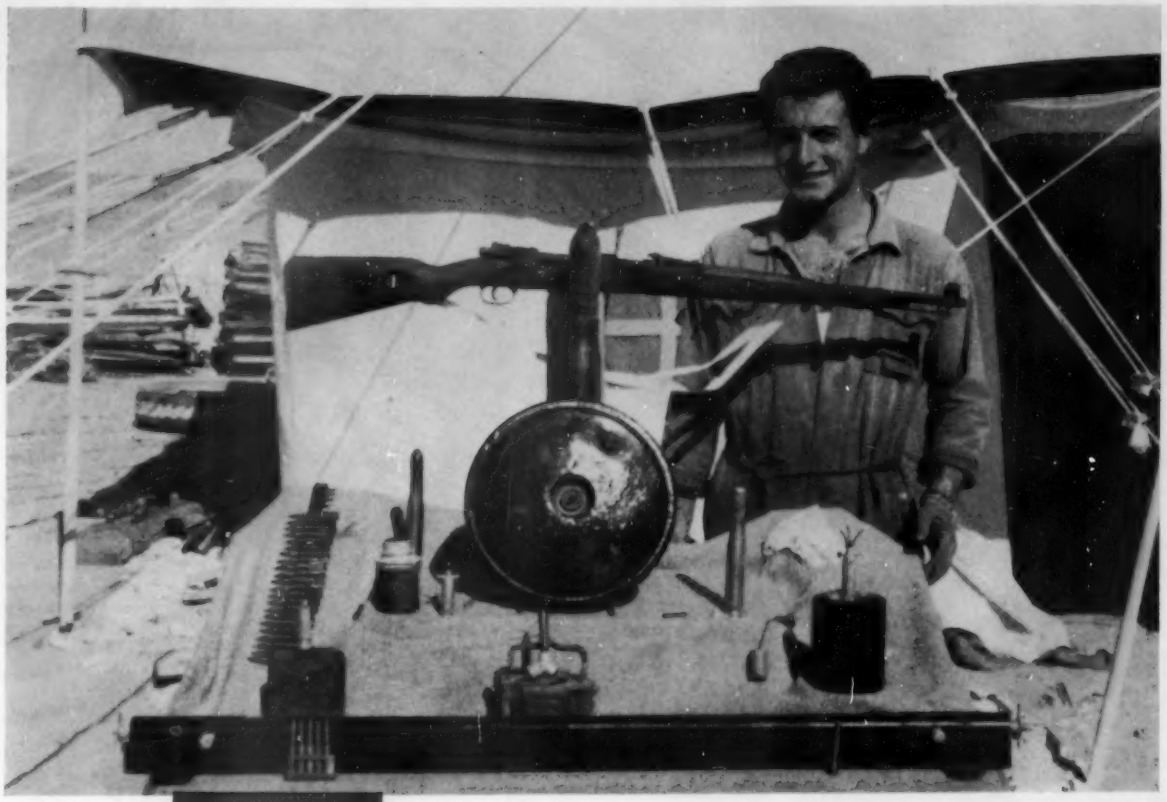
AN ORISKANY gas field in Jackson County, West Virginia, now measures about 1¼ miles square. Krennerman Oil & Gas Co. of Zelienople, Pa., completed the 1 J. M. Powell for 321 M.c.f.d. after fracture through 5½-in. production string. Total depth is 4,847 ft. with rock pressure of 1,525 psi. in 20 hours.

This is the seventh completion in the field. Location is 1,650 ft. west of Long. 81° 40', 9,200 ft. north of Lat. 39° 00', Belleville Quadrangle, Grant District, Jackson County. It lies 2,800 ft. southeast of Hope Natural Gas Co.'s 10159 Lissie Holleron which was completed for 1,861 M.c.f.d. in Oriskany sand, natural. With the new well's completion, the field now totals a potential open flow of 11,633 M.c.f.d.

Webster County

A MAJOR OPERATOR, Sun Oil Co., recently obtained acreage in Webster County, West Virginia—one block of 6,000 acres at 50 cents per acre per year, plus $1 per acre per year bonus, with no drilling obligations stipulated.

Sun's lease is located in the southern part of the Holly District on the Brockerhoff Estate. It lies just off



Libyan Sands Yield Forgotten Arsenal

. . . to GSI crews in their search for oil

Before they can probe the subsurface for geophysical data, GSI field parties in Libya must probe the desert sands for dangerous remnants of World War II.

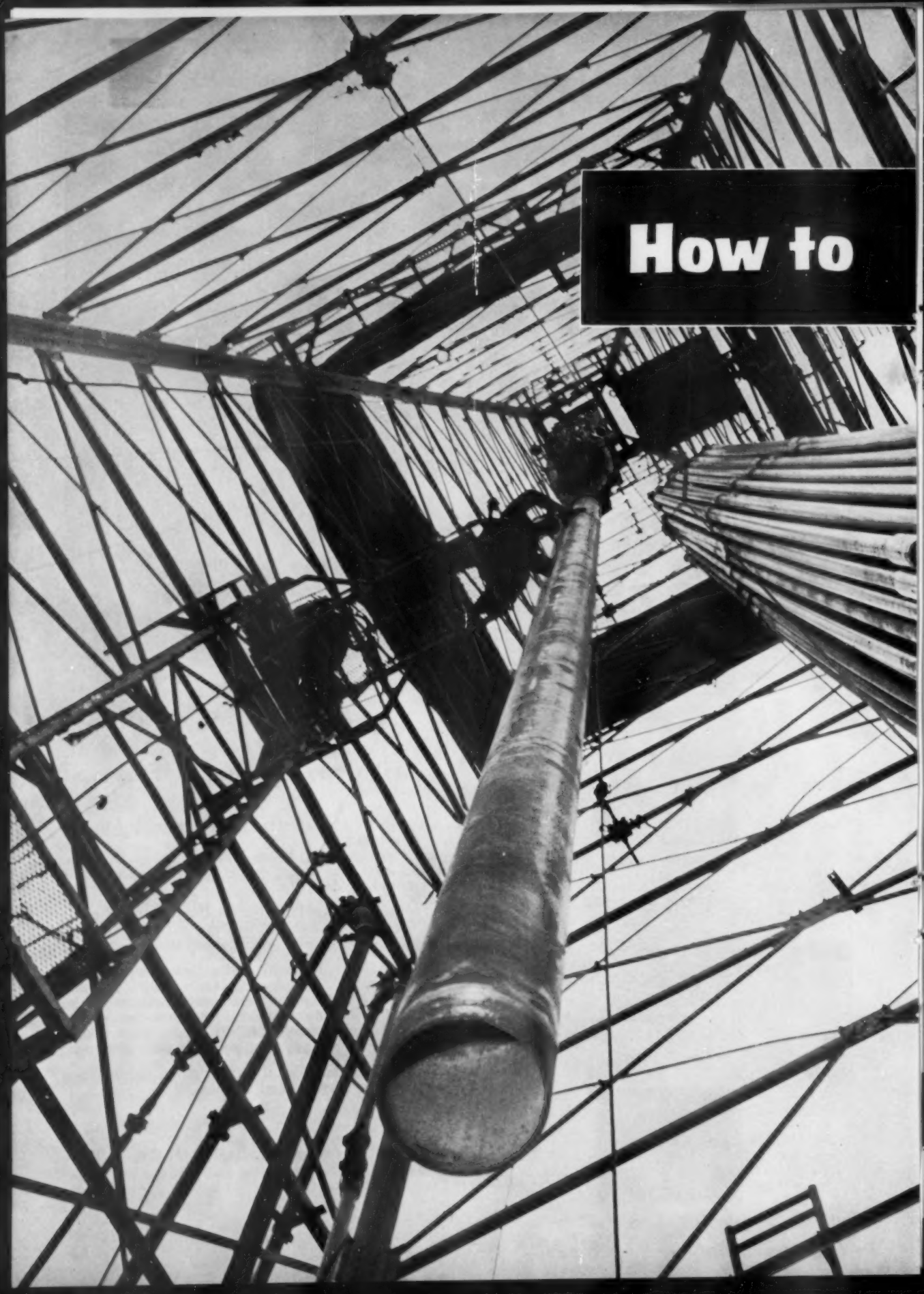
German Teller mines, British, French, and Italian bombs, artillery shells and other relics of desert fighting are turned up by GSI mine clearance parties in advance of geophysical exploration.

Uncovering and disarming anti-tank and personnel mines isn't usually considered part of a geophysicist's job, but, to get the data its client needs, GSI has taken mine clearance in its stride. GSI counts among its demolition experts former members of the British Eighth Army and Rommel's Afrika Corps... now working side by side to reap what they had sown nearly twenty years ago.

In all fields of exploration GSI has the experts and the facilities to get the job done the way it must be done.

GEOPHYSICAL SERVICE INC.

900 EXCHANGE BANK BUILDING • DALLAS 35, TEXAS


How to

Buttress Long Strings

J&L Buttress Thread Casing has marked advantages in deep wells.

The couplings are longer. Pipe and couplings have longer, stronger threads. All threads engage fully . . . there are no vanishing threads as in conventional joints. These threads, five to the inch, Acme type, are angled to take tensional loads in sheer.

Inside clearance is not reduced (no internal upset). The pipe stabs easily and spins rapidly which means fast running time.

Buttress describes the product as well as the thread. The exceptional quality inherent in all J&L tubular goods is present in **J&L Buttress Thread Casing.**

Quality control in the steel making and finishing processes is precise, exacting and continuous. Nothing is taken for granted. The highest-capacity in-line hydrostatic pressure tester in the world (up to 20,000 lbs. per square inch) checks **J&L Buttress Thread Casing.**

You can truly "Buttress" your long strings — and your production — with J&L casing.

Jones & Laughlin

SUPPLY DIVISION – Tulsa

If it's sold by J&L . . . .
It's the best available

Buttress Thread Joint

the west flank of the Webster Springs anticline. Topo location is within S. Lat. 38° 15', E. Long. 81° 30', about 2 miles northwest of Bolair, W. Va.

Another block consists of 5,000 acres at 50 cents per acre per year, no bonus paid and no drilling obligations stipulated. This lease is located on the northern end of the Webster Springs anticline in the southern part of Hacker Valley District. Topo location is 2½ miles south of Lat. 38° 45', 1¾ miles west of Long. 80° 15'. Sun has no immediate plans for wildcatting here at this time.

More oil for Oklahoma's Keyes

NORTHWEST OKLAHOMA'S big Keyes gas area may have another oil producer. This eastern Cimarron County basal Pennsylvanian gas-producing region has been enjoying great success of late in finding oil in the Pennsylvanian.

The newest discovery is Sierra Petroleum Co.'s 1 Watson in C NW SE 36-5n-7eCM, 3 miles north of the town of Keyes. The last swab gage reported was 6 bbl. hourly, decreasing to 4 bbl. per hour later. Perforations are at 4,850-60 ft. in Keyes sand.

Other activity in Cimarron County, the westernmost county in Oklahoma's Panhandle tier, includes a staked location by Amabassador Oil Corp. 1 mile southeast of the 1 Krone, recent Morrow-Pennsylvanian oil discovery at Keyes. The new well is the 1 Bawbell in SW SW NE 32-4n-9eCM, 3 miles south of Golf.

If Concho Petroleum Co. of Dallas hits at their remote wildcat, the 1 E. L. Stufflefield in C NW NW NE 3-1n-3eCM, 4 miles northeast of Felt, Oklahoma's westernmost production would be established. This 5,900-ft. wildcat is 34 miles from any production. It lies in the southwest corner of Cimarron County.

Cotton Valley tests staked in Linden Texas area

Four new wells for the new East Linden field of southern Cass County have been announced by Pan American Petroleum Corp. Three of the drill sites are to the northeast of the discovery, and the fourth is to the southwest. All are scheduled to around 11,200 ft. to test the Cotton Valley formation.

Pan American 1 East Texas Iron Co. is a southwest stepout to the field discovery; on a 246-acre tract in George S. Young Survey, A-1161.

On the northeast are 1 J. W. Vest, 1 George W. Morse, and 1 W. T. Vaughn. All are in the George S. Young Survey.

Pan American 1 Giraud Gas Unit, discovery of East Linden field, is shut in waiting permission from the Railroad Commission for triple completion. Completion has been made from perforations at 10,620-38 and 10,653-63 ft., where it flowed 281 bbl. of oil a day through small choke. Other pay zones are at 9,864 and 10,278 ft.

A RELIABLE SOURCE FOR CATHODIC PROTECTION SUPPLIES AND SERVICES

The exacting standards CSI engineers have set for themselves are your guarantee of your money's worth. You will find it pays to check with CSI when you need materials or services to stop corrosion on buried or submerged structures.

CSI engineers are pioneers and experts in cathodic protection —for transmission and distribution pipelines, oil and gas well casing, tank bottoms, etc. They offer a complete line of:

- **Brand-name materials and equipment, including**
  - Good-All rectifiers to meet your requirements
  - Dow magnesium anodes, including Galvomag
  - Packaged and special anodes to your specifications
  - National graphite anodes, Duriron anodes
  - Instruments by Agra, Fisher, Collins, etc.
  - General cable, Cadweld equipment, many others
- **Expert engineering and installation services**
  - Consulting and design—experienced crews
  - Equipment to handle the largest turnkey job

Large stocks for immediate shipment. Competitive quotations or estimates without obligation. Let us demonstrate our economical and satisfactory service. Call or write today.

CSI

Cleveland 13, Ohio
1309 Washington Ave.
Tel. CHerry 1-7795

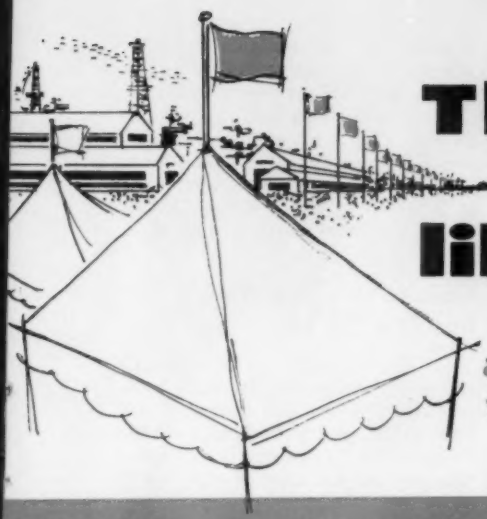
CORROSION SERVICES INCORPORATED
General Office, Tulsa, Okla.
Mailing Address:
Box 787, Sand Springs, Okla.
Tel. Circle 5-1351

Next Week in exploration

Offshore

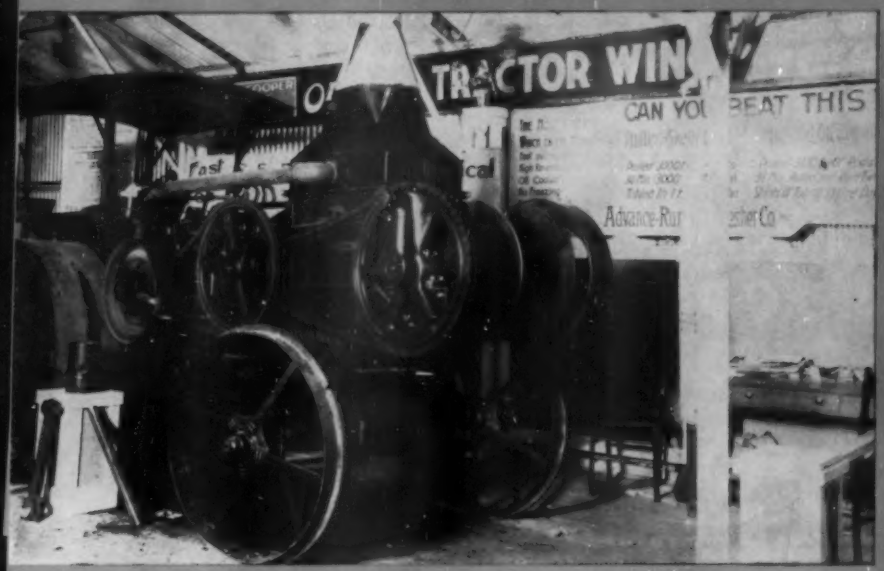
in

Lake Erie



There's no time like Showtime...

and FRED E. COOPER, INC. has been in the big show since the Early Days!



One of the original models of Cooper Rumley Oilpull winch tractors displayed in early Tulsa I.P.E.

ORIGINATOR OF MOBILE WINCH UNITS

WHILE YOU'RE AT THE EXPOSITION . . .

See the COOPER SKYTOP 66′ DOUBLES DERRICK Pulling and Racking Pipe in DOUBLES

See the complete line of COOPER PORTABLE RIGS for Workover and Servicing

See the COOPER display of Pumping Engines

DISPLAY SPACES

East ¾ of Block A, Block B and Block D.

FRED E. Cooper, Inc.

P. O. BOX 1890 TULSA, OKLA.

Branches: Houston, Odessa, Olney

SINCE 1918

North Buffalo adds seventh pay

THE northwestern Anadarko basin's only real multipay field gained a seventh pay zone last week—the Morrow Pennsylvanian.

Harper County's North Buffalo field in northwestern Oklahoma already has production from Lansing, Kansas City, Oswego (Pennsylvanian), Viola Ordovician, and Chester Mississippian, giving the distinction of the field with the most pays in this part of the basin.

Sinclair Oil & Gas Co., discoverer of the field, also added the seventh new pay strike. The 1 Rogers, C SW NW 8-28n-22w, 6 miles northeast of Buffalo town, flowed 1,420 M.c.f.d. from Morrow at 5,668-96 ft.

Dry Sooner areas get first gas

TWO TOWNSHIPS in Oklahoma Panhandle's Beaver County got their first production. One of the important discoveries, both in the southern part of the county, is Vickers Petroleum Co. 1 Nyle W. Mahaffey, NW SE 18-1n-25eCM. It flowed 5,700 M.c.f.d. on 18/64-in. choke from Morrow Pennsylvanian at 8,420-80 ft.

Vickers 1 Anna Howard, a west offset and confirmation discovery to an earlier strike, flowed 3 M.M.c.f.d. plus 6 bbl. condensate per hour from Tonkawa Pennsylvanian perforations at 5,543-76 ft. and 5,924-44 ft. Location is in NW SE 13-1n-24eCM.

MERCOID®

New in size in weight

EXPLOSION-PROOF TEMPERATURE PRESSURE CONTROLS

Class 1, Group C & D;
Class 2, Group E, F, G;
NEMA 7CD, 9EFG

APPROX. WEIGHT 8 ¼" LBS.

Outside adjustments

Hermetically sealed mercury switch

Visible calibrated dial

Visible operating point indicators

Visible On-Off circuit

Here are a few of the many functions Mercoid Controls perform in safeguarding major pipeline equipment:

High bearing temperature
Lube oil pressure

High discharge pressure
High case pressure

Instrument air pressure
Mechanical seal failure

Low suction pressure
High case temperature

Differential pressure for pressurized control rooms

Mercoid Controls are available in steel cabinets made to your specifications.

WRITE FOR BULLETIN DAH

THE MERCOID CORPORATION
4201 BELMONT AVENUE, CHICAGO 41, ILLINOIS

Oklahoma's Woodward has first '59 hit

Woodward County in northwestern Oklahoma has its first discovery prospect of the year. This county, it will be recalled, is the birthplace of the Pennsylvanian spree that has engulfed this part of the state in the past 3 years.

Woodward's newest hope is Shell Oil Co. 1-30 Munson, 13 miles northwest of Mooreland and 8 miles north of Northeast Woodward field. The well flowed 3,400 M.c.f.d. from Morrow sand. Tests continue with no further details available.

Bowl of Fire spudded in Nevada

IN NEVADA, Shell Oil Co. became the first major company to join the deep search for production in southern Nevada by spudding in a projected 8,000-ft. wildcat in the Bowl of Fire area of Clark County, 40 miles southeast of Las Vegas.

The Shell well, labeled in advance a "tight hole," will seek production in the Paleozoic.

Shell is still the only company with production in this gambling state with three wells at Eagle Springs, in Nye County, 160 miles north of the Las Vegas area.

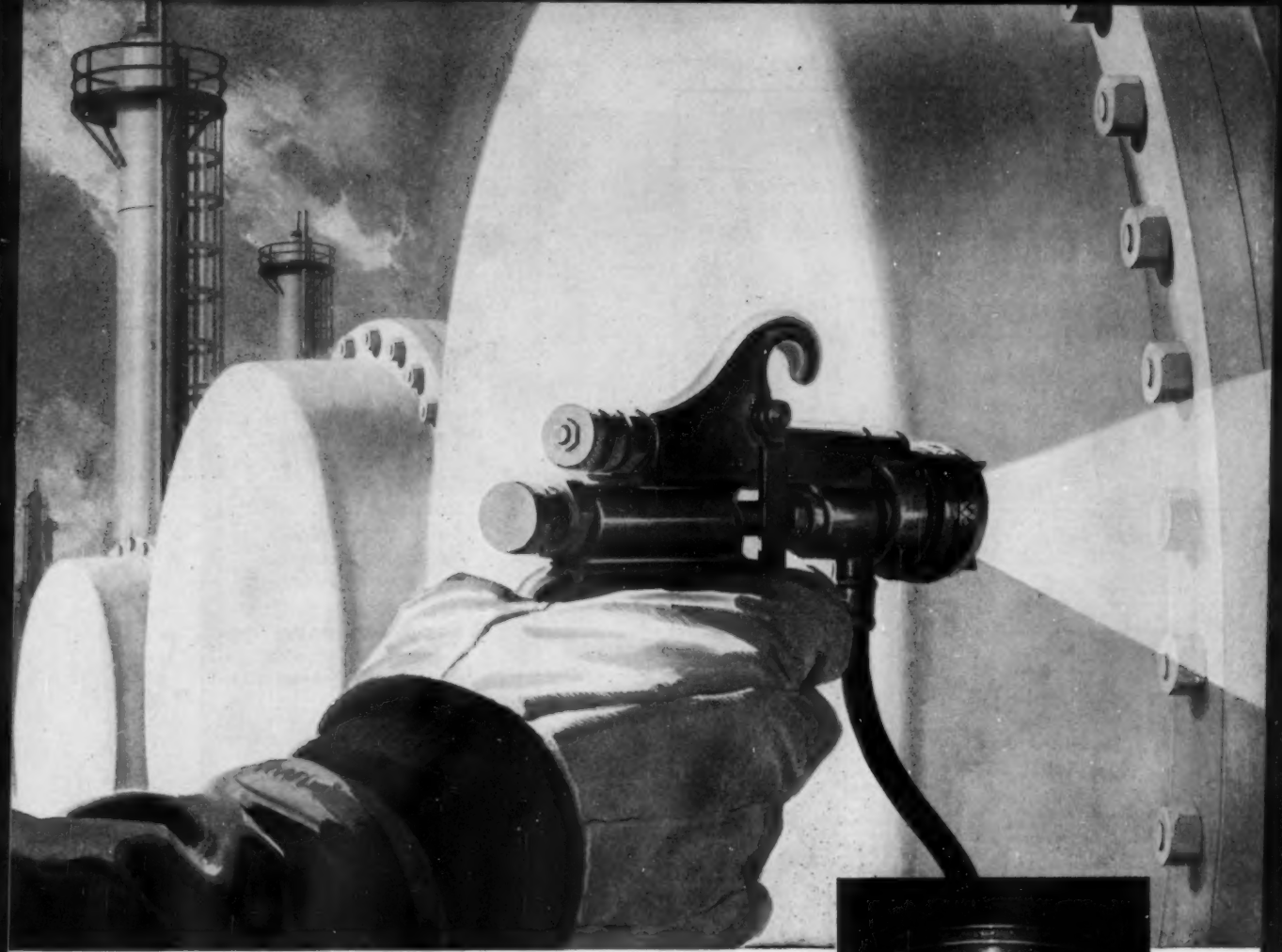
Ohio pool extended

In Ohio, Creola Petroleum Co. was again successful in its effort to extend the old Richland field eastward in Swan Township, Vinton County.

Their 2 H. W. Earnhart, Section 20, a ½-mile stepout, topped the Clinton at 2,666 ft. and was drilled to 2,684 ft. Gage natural was 498 M.c.f. and 4,070 M.c.f. with rock pressure of 400 psi. 1 week after fracture.

Two other recent completions by the same operators in Section 28, were also gassers. 1 D. Williams gaged 1,200 M.c.f. and 1 J. Johnson gaged 60 M.c.f. in the Clinton.

In Section 21, 1 H. H. Frampton was reported to have 2,490 M.c.f. natural but as yet is not finaled.



Humble Coatings Give You Three-Way Reduction in Maintenance Costs!

Humble coatings last six months to a year longer than most other paints. You save *two* ways — on paint and labor. The *third*, and most important, way you save is this: you get better protection, which means longer life for expensive equipment.

Humble coatings contain rust-preventing ingredients that not only provide surface protection, but also neutralize any corrosive elements that may penetrate the surface protection and attack the metal. These coatings were specially developed to give maximum protection in refineries and chemical plants where strong acids, alkalis and salt sprays produce severe corrosive conditions.

Without cost or obligation, one of Humble's trained engineers will make a thorough study of your needs and recommend a complete painting program for you. Call your nearest Humble representative, or phone or write:

HUMBLE OIL & REFINING COMPANY
Consumer Sales, P.O. Box 2180,
Houston 1, Texas

Humble's line of coatings includes —

- RUST-BAN ®
- Epoxies
- Phenolics
- Tank coatings
- Vinyls
- Acrylics
- Enamels
- Hot surface coatings
- Interior and exterior emulsion-type paints

HUMBLE

THOMPSON
SAND RESISTANT OIL WELL PUMPS

TRAVELING PLUNGER ROD TYPE BOTTOM HOLD-DOWN PUMP
STANDARD SIZE
Figs. 400P, 600P, 700P, 800P

Single or double, self-aligning, combination cup and plunger or all-metal traveling plunger type pumps made in four sizes: regular 1¼", 1½" oversize, 2" regular and 2½" oversize bore. These pumps seat in API seating device. In very sandy wells, or when tubing is out, we recommend our SAND HOUSING MECHANICAL SEATING SHOE, which prevents sanding in of pumps as sand can be dumped and the pump pulled at any time by our sand flushing arrangement.

TOP HOLD DOWN INSERT ROD PUMP
Standard Size
Figs. 400T, 500T

Self-aligning double plunger insert pumps. Made in three types: combination cup and single plunger; combination cup and double self-aligning type; and metal-to-metal double plunger self-aligning type. All are equipped with Regular or Extra Long Alloy Plungers, ground individually to fit the barrels, assuring longer life on both pump and surface equipment.

SPECIAL HEAVY DUTY SEALING DEVICE

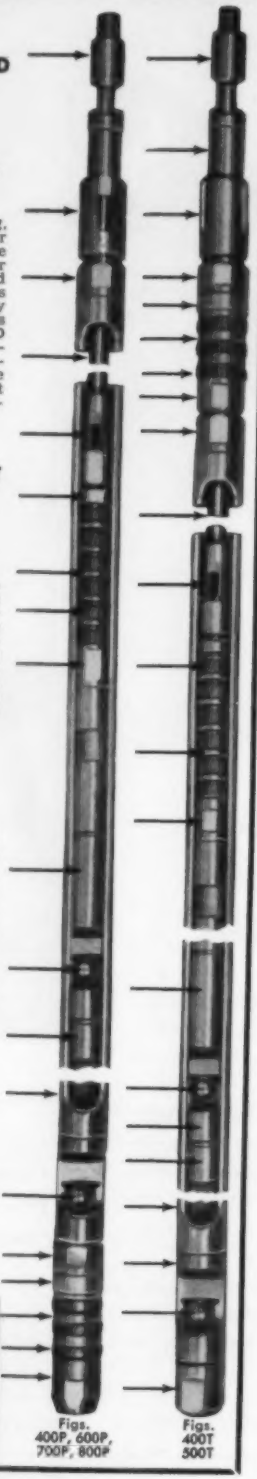
This special Combination Sand Housing and Seating Device is invaluable in bad sand conditions, especially where pump is sanding into the tubing. In extremely sandy wells the pump may be unseated occasionally to allow a small portion of tubing fluid to flush through the sand housing and return the accumulated sand to the well.

Pumps for all fields, depths and conditions. For further information write for complete catalog.

SALES & SERVICE STORES

Drumright, Okla.
Edmond, Okla.
Eureka, Kansas
Healdton, Okla.
Heidelberg, Miss.
Kilgore, Texas
Natchez, Miss.
Oil City, Miss.
Reed City, Mich.
Seminole, Okla.
Shidler, Okla.
Stephens, Ark.
Vivian, La.

THOMPSON PUMP COMPANY
OKMULGEE, OKLA.
DRAWER 591



Figs. 400P, 600P, 700P, 800P

Figs. 400T 500T

Why the Barclay's
EXECUTIVE SUITE PLAN
is so much more important to business concerns today

By leasing an apartment at The Barclay on an economical year 'round basis, you'll be assured of these definite advantages:

1 Guaranteed accommodations, even during crowded periods, for your key executives and important customers.

2 Simplified accounting; clear record of expenses for income tax purposes.

3 Convenient for confidential "away-from-the-office" meetings, etc.

4 Newly styled suites, with serving pantries, air-conditioning, round-the-clock service.

5 A real time saver! The Barclay is in the heart of Manhattan's midtown business district.

The Barclay

"Home of Executive Suites"
111 East 48th Street, off Park Avenue
NEW YORK—PLaza 5-5900
Tom Kane, *General Manager*

A REALTY HOTEL
Harry M. Anholt, *President*

EVER WONDER ??

Geoquestion . . .

Who's right? Is it Bone Spring or Bone Springs limestone? This important producing formation of the Delaware basin of West Texas and Southeast New Mexico pops up spelled both ways.

Geoanswer . . .

We'll take Bone Spring. The Lexicon of Geologic Names of United States calls it Bone Spring limestone of Permian age. In 1929 the AAPG Bull., vol. 13, p. 962, states that the formation was named for Bone Springs Canyon in Culberson County, Texas. This is good enough for us, but in the Geol. Soc. Am. Bull., vol. 45, pp. 731, 755-768, 1934, P. B. King changed the name to Bone Spring, because there is only one spring in Bone Canyon, although the place is locally called Bone Springs. This usage was approved by the USGS. Whether the canyon has one spring or a roaring tide, we like Bone Spring.

Offset to discovery brings in new Texas pay

A test which was spudded as a confirmation attempt for the Rafter Cross field in Borden County, West Texas, instead has yielded new pay uphole from the original Ellenburger target sand.

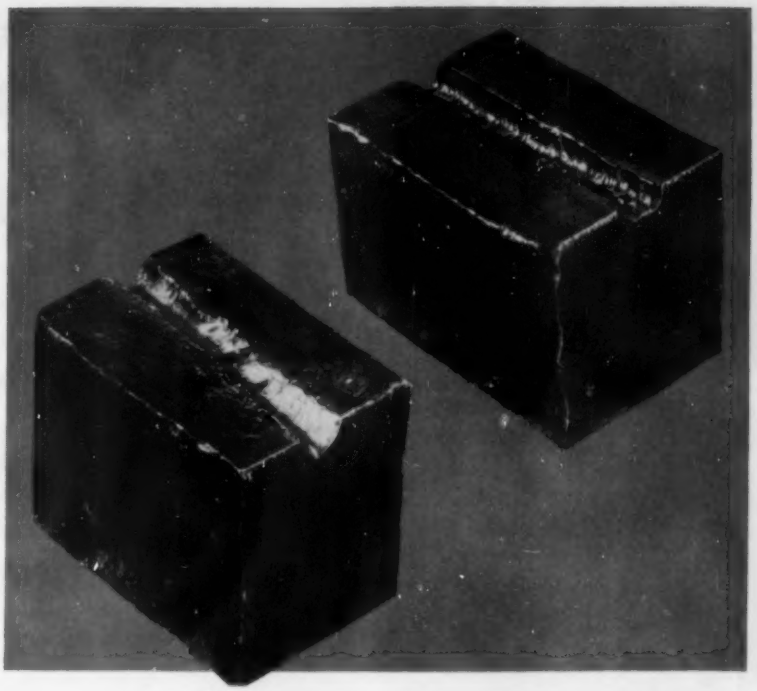
Trice Production Co. 1 Frank Miller, located 5 miles northeast of Gail, seat of Borden County, is a direct south offset to the Rafter Cross field discovery well, an oil producer completed from Ellenburger at 8,500 ft.

Projected to 8,600 ft., Trice's confirmation test found the Ellenburger to be water bearing but encountered commercial production uphole in the Strawn in a zone from 7,935-8,282 ft. Total depth was 8,505 ft.

Completion operations were under way on the well, which is located on a 640-acre Trice checkerboard tract.

Big Sandy field grows

In the Pike County sector of Big Sandy gas field, Kentucky West Virginia Gas Co. deepened 1052 W. H. Coleman from old total depth of 1,557 ft. to 1,756 ft. Located on Marrowbone Creek, the well was initialed for a natural open-flow potential of 582 M.c.f.d. of gas from Maxon (Mississippian) sand. A rock pressure of 257 psi. was established in 12 hours.



Which stainless steel block was grooved in just 12 seconds?

It took 10 minutes to chip a ¼" deep, ⅜" wide groove in this 3¼" long stainless steel block on the left. Arcair did a better job in just 12 seconds . . . or 1/50th of the time. (See block at right.) Groove is 5/16" deep; 7/16" wide. Both blocks were cut from the same stainless steel bar.

You can groove, cut, gouge or bevel *any* metal faster with Arcair . . . get significant cost savings. Yet, the Arcair process costs less than $100.

HOW DOES ARCAIR WORK? The torch uses 80 p.s.i. air, welding machine current and special electrodes to melt and instantly blow away metal. There's no oxidation. New operators learn everything in 15 minutes.

WHAT'S YOUR PROBLEM? Write us. Without obligation, we will recommend correct torch and method to help you cut costs. (Or, call your Arcair welding supply distributor.)

Arcair

THE ARCAIR CO.,
479 S. Mt. Pleasant St., Lancaster, Ohio
Send me more information on Arcair Torches and special electrodes.

(NAME) (TITLE)

(COMPANY)

(ADDRESS) (CITY) (STATE)

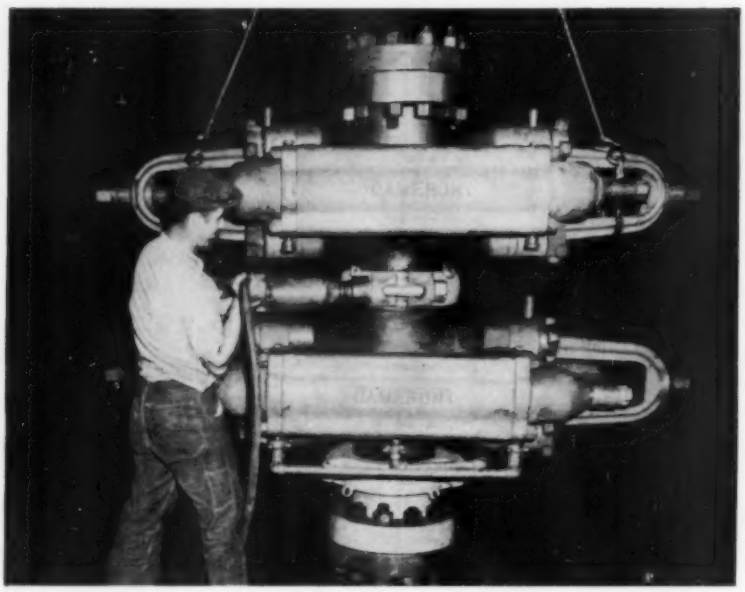
MY PROBLEM

AVONDALE

dual service for the OIL INDUSTRY

NEW CONSTRUCTION

A leading steel fabricator, Avondale designs and builds offshore drilling barges that are among the world's largest.



OIL TOOL REPAIR

A special service, designed specifically for the oil industry, with large shop facilities and round-the-clock service.

Avondale salutes the INTERNATIONAL PETROLEUM EXPOSITION

AVONDALE

MARINE WAYS, INC.

VERSATILE BUILDER ON THE MISSISSIPPI

P. O. BOX 1030 • PHONE UNiversity 6-4561 • NEW ORLEANS 8, U. S. A.

Here's big-company approach to small-field profits

BY LEWIS HEWITT
Geologist, San Antonio

ASK the exploration manager of any major company what one of his biggest problems is and he will answer, "The size of the average oil field today is so small that we can't afford to produce it at a profit." The object of this article is to offer a plan for prospecting small fields by major companies—at a profit.

Rare bird . . . Fifteen years ago every major company had its own rigs and company drilling crews. Today they are a rare sight. Because of the high taxation on all this excessive capital equipment, most companies found it expedient to hire independent contractors and charge off all their intangibles. The major company exploration department and production camps are heading for the same fate.

A Solution

Why not hire independent exploration departments and production departments to find and produce the oil? This could be literally accomplished by retaining a skeleton crew of exploration geologists to evaluate prospects which are submitted by independents. If a prospect fits his company's standards of trend, sand, structure, etc., and the deal is for sale at a fair price then the geologist recommends buying an interest in it.

The company then can afford to pay an independent a price for a one-half interest which is sufficient in most cases to almost drill the well, and still get it cheaper than the one-half interest would cost by virtue of doing their own work. This is possible because of lower operating expenses especially in mud, surface casing, and various third party costs, to which majors oversubscribe for protection purposes.

The independent can drill, core, and test to the satisfaction of the major via a written contract to assure a satisfactory performance. If the well is successful the company pays its part of completion and the independent operates the property which also can, for the most part, be regulated by contract. Since the operation is maintained by the independent the company needs no complete staff of well sitters, development geologists, engineers, roustabouts, camps, large inventories of well equipment, and all payments for these services to the independent operator are deductible.

As with drilling, an independent can operate a property cheaper because of numerous reduced costs. All the company needs is one man in the auditing department to endorse the checks when they come in. Actually, in practice many details would need ironing out; however, the main point is that any play, from a shallow one-well field to a giant field can be played for a bigger profit by the major company simply because the previously prohibitive staff of employes and equipment which made small production unprofitable is now eliminated.

This does not mean that majors should rush out and fire all their field men. It is not intended that this method should replace the entire exploration department; but, whether they will admit it or not, a large part of today's exploration efforts is spent on trivials simply because it is difficult to pass up a good prospect even if it is small. A good portion of this effort can be taken over by independents. Companies will still look for and maintain their own production of a size where it can be profitably handled. By handling prospects in this manner, thousands of wells and millions of barrels can be added to their reserves in the formerly **"too small to fool with" class.**

One of the obvious difficulties which is immediately faced is the honesty and integrity of the independent from whom the company will buy these plays. This should be no severe

KOLOR KUT
GASOLINE GAUGING PASTE
Gives accurate gauges of light hydrocarbons (Butanes, gasoline, kerosene, crudes). Turns red on contact. Will not creep up gauge line.
THE GAUGERS' FRIEND
KOLOR KUT
WATER FINDING PASTE—
Turns red on contact with water level. Assures accurate gauges.
Write
KOLOR KUT PRODUCTS CO.
Box 5415 • WAlnut 6-4780 • Houston 12, Texas

SLICKEST WAY TO TD

USED AND RECOMMENDED

. . . *especially* under conditions where DRAG, TORQUE, OR THE HAZARD OF STICKING DRILL-PIPE, LINER AND CASING are encountered.

SIX YEARS OF FIELD EXPERIENCE

have proved the effectiveness, versatility and trouble-free application of

92 SOUTHWESTERN FLAKE GRAPHITE

Available through your mud dealer.

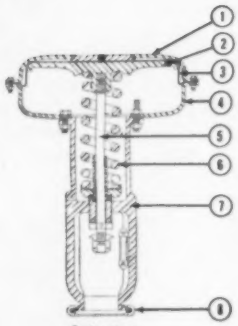
92 SOUTHWESTERN GRAPHITE CO.
BURNET, TEXAS

THESE FEATURES

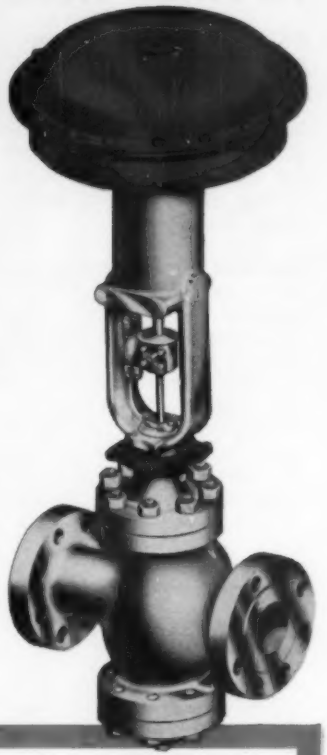
Make The BS&B *Super* 70

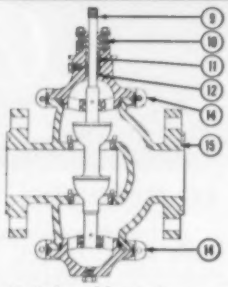
TODAY'S OUTSTANDING VALVE IN ITS CLASS!

BS&B Super 70 Control Valves are widely used with instruments to control pressures, temperatures, liquid levels and flow. They efficiently handle gas, air, vapor, steam or liquids in a wide variety of applications. Valve bodies are available with either the patented clamp ring —float ring closures—up to 600# ASA— or the conventional flanged-gasketed type closures in ratings up to 2500# ASA.

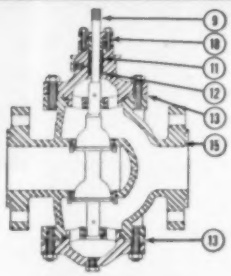


Actuator

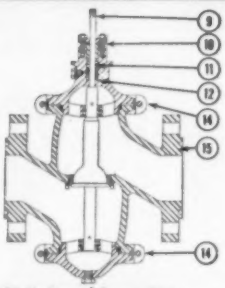




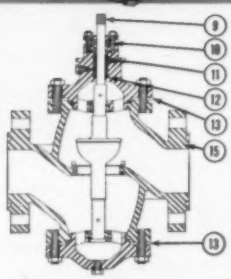
DP Body w/clamp ring—float ring closure



DP Body w/flanged-gasketed closure



SP Body w/clamp ring—float ring closure



SP Body w/flanged-gasketed closure

VALVE BODIES AND INNER VALVES REVERSIBLE WITHOUT ADDITIONAL PARTS

1. Direct, Reverse and Pressure Balanced Actuator
2. Diaphragm Plate of Ductile Iron
3. Moulded Diaphragm of Buna-N With Nylon Inserts
4. Pressed Carbon Steel Case
5. AISI 303 Stainless Steel Stem
6. Tempered Steel Spring, Precision Calibrated To Within ± 2%
7. Ductile Iron Yoke
8. 2-Piece Forged Steel Clamp Ring
9. Type 303 Stainless Steel Packing Follower
10. Heavy Duty Adjustable Bolted Construction
11. Teflon CVU, TA and GA Packing
12. Solid Cast, Step-Type Design
13. Flanged-Gasketed Closure
14. Clamp Ring—Float Ring Closure
15. High Capacity, Stable Flow Body

SUPER BS&B 70

For the location of your nearest BS&B Sales Office or Representative, consult your Chemical Engineering Catalog or Refinery Catalog. Or if you prefer, write directly to us for detailed information.

BLACK, SIVALLS & BRYSON, INC.
Controls Division, Dept. 4-A5
7500 East 12th Street Kansas City 26, Missouri

When you see this being done-

chances are it's with

"500 TON"

USED on more wells throughout the world-wide drilling industry!

Sold ONLY through supply stores

MONEY BACK GUARANTEE!

USE JIMMIE GRAY DOPE BRUSHES

PETROLEUM DISTRIBUTING CO.

BOX 203 • HOUSTON, TEXAS • CApitol 4-9648

problem since most contracts will protect the company's primary investment and as happened with drilling contractors, only those who perform to satisfaction will last.

A difficult obstacle to overcome in selling this idea to management will be the well-known feeling which exists in most majors from the "Promotor Type" with whom they need to deal. The word promotion has a bad connotation in most companies, but after a period of understanding and elimination of undesirable relations this should fade.

The major is not the only one who will benefit from an increase in major-company buying of independents plays. For the independent is also faced with a fickle market of investment money which is for the most part dependent on good times and tax money. These are presently being made more undependable with the new attacks being made on the depletion allowance. A sizable increase of major company investment could stabilize the independents' business and bring a closer relation between two factions which have stood against each other to the detriment of the industry heretofore.

Well, Mr. Exploration Manager, could you use some new reserves for your company?

Advantages

This program of major-company investment in independents' deals offers the following:

- Opportunity to play small fields at a profit.
- A new source of reserves.
- Reduction of staff would be possible.
- Integrated program of major-independent cooperation.
- Source of income and stabilization for the independent.

Texan spuds Michigan test

In Michigan G. W. Strake, Houston, in an acreage deal with Fred W. Turner, William Strickler and Michigan Oil Co. has spudded a 4,300-ft. Niagaran-Trenton wildcat at 1 Helder, NE SW NE 11-5n-15w, Ottawa County.

Location is well out of the hot southern Michigan play and will be closely watched.

Aurora and McClure 1 Bartell, SE SE SE 7-4s-3w, Jackson County, 1½ miles northwest Pulaski pool, has drilled gas section in Trenton from 3,845 to 4,080 ft., gaging 7,700 M.c.f. on drill-stem at 3,990-4,040 ft. Loss zone at 4,070-80 ft. prompted shutdown to install high-pressure equipment.

"ON CALL" 24 HOURS A DAY

ACME OIL TOOL CO.

DEAN DUNSWORTH
Oklahoma City
ORange 7-2426

"Poo Woo" CHAPPELL
Woodward, Okla.
Phone 433

ELDEN SNAWDER
Duncan, Okla.
Phone 3963

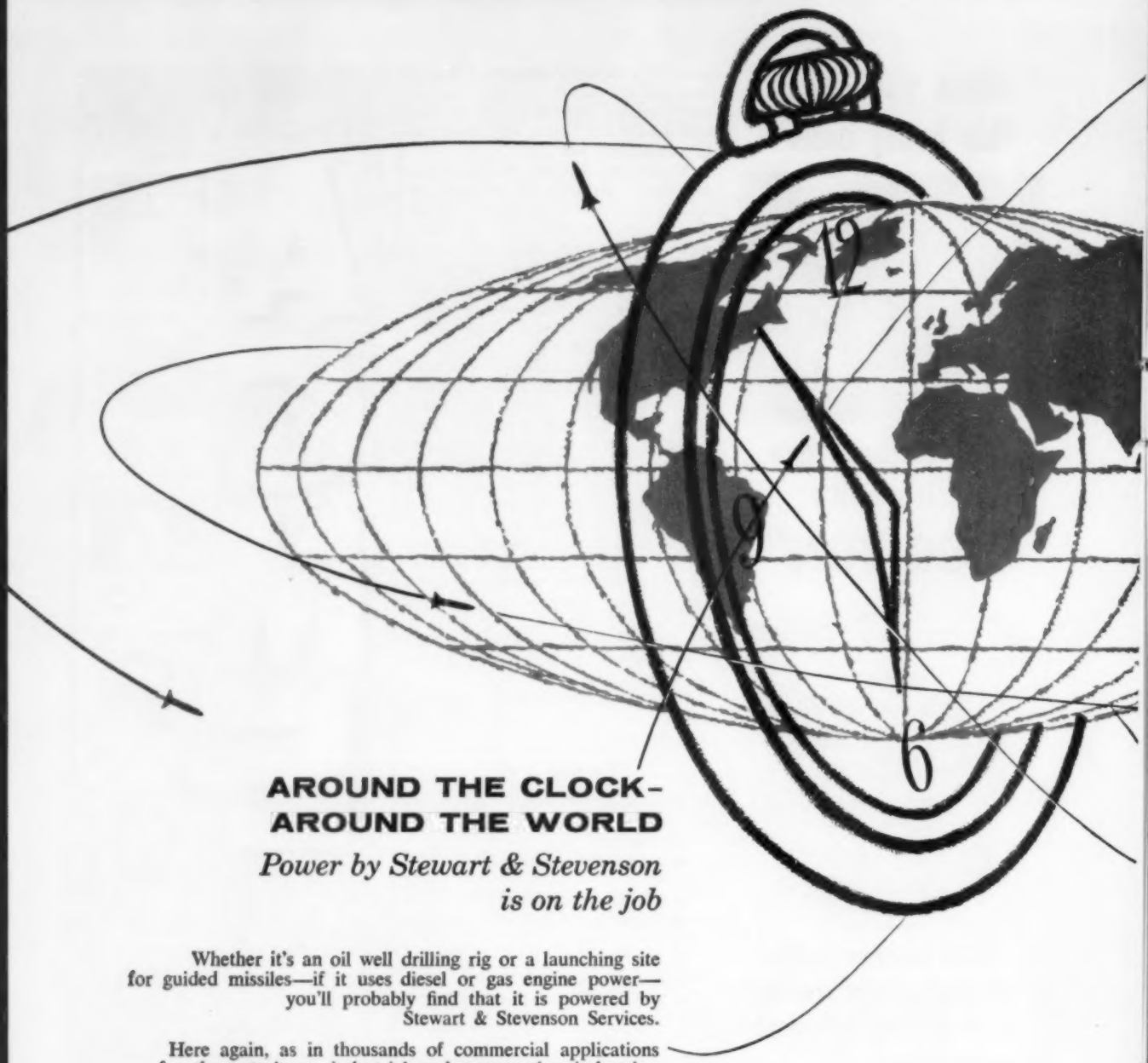
NEWT STANDERFER
Wichita Falls, Texas
Phone 692-4541

W. L. SANDERSON
South Edmonton,
Alberta, Canada
Phone 33-2191

S. W. MUMFORD
Fort St. John
British Columbia, Can
Phone 303

- Fishing and Rental Tool Service
- Drill Pipe
- Rotary Tools
- Blow Out Preventers
- Spang Cable Tools
- Oil Field Machine Shops

GOING FISHING? ACME CALL YOUR FRIEND!



AROUND THE CLOCK–
AROUND THE WORLD

Power by Stewart & Stevenson
is on the job

Whether it's an oil well drilling rig or a launching site for guided missiles—if it uses diesel or gas engine power—you'll probably find that it is powered by Stewart & Stevenson Services.

Here again, as in thousands of commercial applications for the petroleum, industrial and construction industries, Stewart & Stevenson's experience and "know how" is paying off.

If you have a power problem—no matter how difficult or complex it may seem—it's probably "routine" with Stewart & Stevenson. Why don't you take advantage of this experience?

STEWART & STEVENSON SERVICES, INC.

Main Office and Plant:	4516 Harrisburg Blvd., Houston 11, Texas Phone CApitol 5-5341
Branches:	Corpus Christi, Dallas, Lubbock, San Juan, San Antonio, Beaumont, Odessa
Representatives:	Longview, Brownsville, Wichita Falls, Freeport
Export:	Room 1405, 74 Trinity Place, New York, N. Y.

STEWART & STEVENSON

THE WORLD'S LARGEST DISTRIBUTOR OF DIESEL ENGINES

New find opens Panhandle pool

Commercial gage is reported at a new Texas Panhandle discovery ¾ mile north of Farnsworth in Ochiltree County's northwestern part. The new pool-opener is the 1 L. R. Conner, a Texaco, Inc. well in Section 51, Block 4, GH&H Survey. It swabbed 133 bbl. of oil and 24 bbl. acid water in 24 hours. Swabbing continues.

Another discovery in the Texas Panhandle is Shamrock Oil & Gas Corp.'s 7 Dan W. Manning in the Twin Des Moines field, northwestern Ochiltree County. This well is an upper Des Moines new-pay strike. Location is Section 43, Block 4, GH&H Survey, 6 miles northwest of Farnsworth. It pumped 45 bbl. of oil per day from perforations at 6,330-26 ft.

Extension . . . An Ochiltree County producing area, the George Morrow field, moved across state lines into Oklahoma's Panhandle. Atlantic Refining Co. 2 Lawrence Bransgrove, C SE SE 33-1n-20eCM, Beaver County, flowed 82 bbl. of oil in 7 hours after fracture. Pay is the Morrow Pennsylvanian sand at 7,404-28 ft. This is a north offset to the Parker 1 Share which opened the George Morrow field on the Texas side.

New pool tapped in Galveston Bay

In Texas, Standard Oil Co. of Texas, through a ½-mile extension on the north flank of their Cedar Point field in Galveston Bay, has opened a new pool in the upper Vicksburg sand at 7,477-83 ft.

State 94-3 was drilled to a total depth of 10,786 ft. On a 6-hour test this well flowed at the rate of 213 bbl. of 38°-gravity oil per day on 10/64-in. choke. The gas-oil ratio was 360, tubing pressure 660 psi.

Dual pay hit in North Texas

A dual discovery in northwest Jack County, Texas, has been registered by Trice Production Co. with completion of 1 Vera Roney, 3½ miles northeast of the town of Jermyn.

The Trice wildcat potentialed at the rate of 255 bbl. of oil daily with no water, on open-flow test from the Caddo lime at 4,593-4,610 ft. Gas-oil ratio was 500:1.

Gas production at the rate of 10 M.M.c.f.d. was encountered downhole in the Marble Falls conglomerate zone. The operator indicated that this is regarded as a good rate of flow for the area.

Trice has 438 acres in the area of the well, which is located 1 mile southeast of Harwell Strawn field and 1½ miles north of North Wolf upper strawn and Caddo field.

Geology meet set for Duluth, Minn.

THIRTY school science teachers and professional geological scientists from all parts of the country will participate in a 6-week conference on Duluth campus of the University of Minnesota from July 20 to August 28, 1959, to prepare improved materials for the teaching of geology in school science programs.

The Duluth conference which is being sponsored jointly by the American Gelogical Institute and the University of Minnesota, Duluth branch, is a part of a broad and continuing program of public education by the institute.

The AGI is a federation of 14 scientific and technical societies in fields of geology and geophysics, which have a total membership of more than 25,000 geoscientists. The institute operates under the National Academy

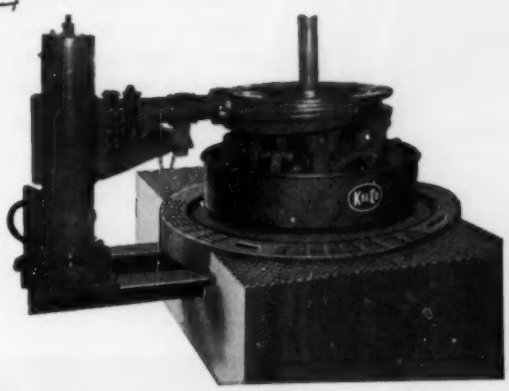
WHICH IS THE **ECONOMICAL** WAY?

this . . .

OR THE

KELCO

WAY?



KelCo Power Slips offer the utmost economy and safety for crew and equipment. Check these features: Automatic Warning Whistle protects both crew and pipe . . . Patented Automatic Safety Latch operates with each lift of the slips . . . Straight in and out movement of slips eliminates chafing of pipe . . . The safety features alone dictate the use of KELCO AIR OPERATED POWER SLIPS.

Be Safety Wise—KelCo-ize

KELCO BEN F. KELLEY CO., Inc.
TULSA, OKLAHOMA

SALES AND SERVICE REPRESENTATIVES IN MAJOR DOMESTIC OIL CENTERS
FOR EXPORT, CONTACT IDECO—ONE OF THE DRESSER INDUSTRIES
OR YOUR FAVORITE SUPPLY COMPANY

CATHEADS • POWER SLIPS • TUBING TONGS

This one will jar you!
This combination jar and keyseat broach is an improved design – engineered to provide positive jarring action when necessary.
With more cutting surfaces than ever before, this Hunt-McClinton tool does a faster, better job.
For details, write Hunt Tool Company or telephone Houston. FA 3-7131.
built on good service
HUNT
TOOL COMPANY
Houston, Texas

Serving the oil industry for more than a quarter-century – with inventive know-how and the best service in the business.

of Sciences—National Research Council.

Dr. Robert L. Heller, associate professor and head of the geology department on the Duluth campus, has been selected by the AGI as the director for the Duluth conference.

In California . . .

LaHondra lures Humble

Quiet San Mateo County on the coast was slated to get a wildcat drilled by Humble Oil & Refining Co. 7 miles northeast of the small town of Pescadero. Nearest production to the Humble test location is LaHonda field 5 miles northeast and at Oil Creek field 5 miles southeast.

Tejon gets duster

One of the few dry holes drilled by operators in North Tejon field turned up in a north extension test drilled by Richfield Oil Corp. in the Highway area. The unsuccessful Richfield test was located in SE SE 13-11n-20w, about 1,500 ft. northeast of the nearest producer. Richfield took the test, 87-13 KCL I, to 12,269 ft. and tested an interval at 11,676-11,793 ft. before deciding to call it quits. The only other significant dry hole drilled at North Tejon was also a Richfield extension, this one on the extreme west edge of the area.

Additional Gosford pay proved up by Signal

Signal Oil and Gas Co. successfully extended production in East Gosford field of Kern County about 2,000 ft. north of the nearest previous producer. The Signal well, 47-12 KCL, was completed flowing at a rate of 300 bbl. daily from perforations at 7,008-20 ft. and 7,194-7,206 ft. Total depth was 7,985 ft.

Garrison City gas pool extended

The Garrison City gas field discovered in January was extended ½ mile to the east by a Richfield Oil Corp. completion in SE NE 9-28s-24e, Kern County. The Richfield well, 1 ROCO-Mitchel-Thiessen, was completed in a Mullinia sand interval at 4,466-88 ft. and a Mitchel sand interval at 5,953-55 ft. The upper zone flowed through casing at a rate of 7,800 M.c.f.d. while the lower made 4,640 M.c.f.d. The upper choke was 25/64 in. and the lower 22/64 in. Tubing pressure was 1,450 psi. The well has been shut in pending a pipeline connection.

So accurate it's the world's first choice!

No matter where in the world you go, Kilgore or Kuwait, you'll find oilmen swearing by the accuracy of the TOTCO double recorder. Not satisfied with one reading, the reliable TOTCO double recorder checks itself—with only *seconds* elapsing between first reading and check. That's why most oilmen the world over say, "Be sure you know, use TOTCO!"

TOTCO

Technical Oil Tool Corporation

1057 North La Brea Avenue • Los Angeles 38, California

EXCLUSIVE DISTRIBUTORS: *California*—The Republic Supply Co. of California; *Domestic*—The Continental-Emsco Company, a division of Youngstown Sheet & Tube Company; *Canada*—Oil Well Supply Division, United States Steel Corporation; *Export*—Lucey Export Corp., New York City

Russ McQuiston

Jeff Cravens

Stan Martin

REPUBLIC RUBBER

will be at the Oil Show

Have questions about rotary hose or other rubber products? These men know the answers and will be on hand at the Oil Show to meet you and supply any information.

They represent Republic Rubber in sales and in technical capacities. All of them will be in attendance at the Oil Show.

Republic Rubber makes many products for the oil industry, including hose and belting for exploration, drilling, producing, refining, transporting, and marketing. You may want to know more about Republic's rotary hose which has been outstanding in this tough service.

Fred Lane

Ruth Conklin

Howard Sprinkle

J & L SUPPLY

Republic will be located in the J & L Supply building. Republic hose for the oil industry is sold through J & L Supply stores.

REPUBLIC RUBBER DIVISION

LEE RUBBER & TIRE CORPORATION, YOUNGSTOWN 1, OHIO

INDUSTRIAL RUBBER PRODUCTS

Three wells slated north of Pembina

IN ALBERTA, Pan American Petroleum Corp., Texaco Exploration Co., and Pacific Petroleums, Ltd. are about to embark on a three-well drilling program a short distance north of the northeastern sector of the huge Pembina oil field.

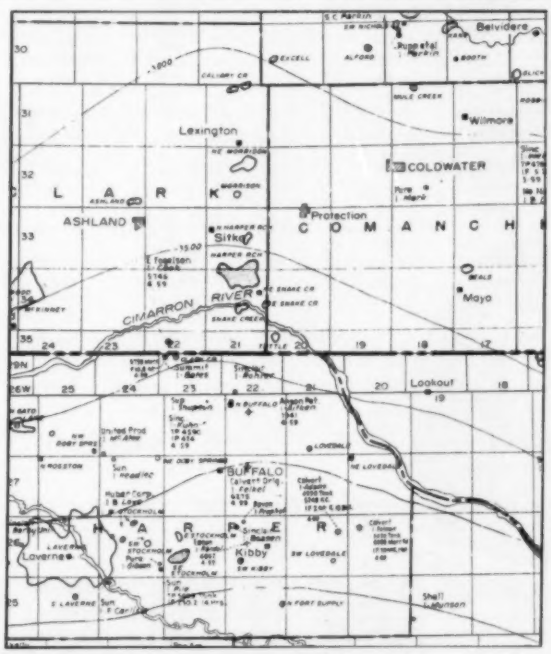
This team uncovered an excellent Cardium sand oil zone while drilling 3 miles from previous production in the region and it is around this that the program has been scheduled. While staking only three wells at this time, it is thought that a pair of rigs will be kept active indefinitely around the strike in order to fully determine its extent and to find out if it is an extension to the Cardium sand in the field.

Actually the discovery well was carried down to the Mississippian horizon and then plugged back to the Cardium sand for evaluation tests. After casing was set in the hole a 16-ft. interval was perforated around the 4,480-ft. level. The well kicked off flowing 879 bbl. a day through a 1½-in. choke.

The well, Pan American et al. 6-15-50-7 Lobstick East, was drilled on LSD 6, 15-50-7w5. It is 3 miles north of Cardium zone oil in the Pembina field, 75 miles southwest of Edmonton, and 4½ miles southeast of Pan American et al. 6-5 Lobstick East basal quartz zone wet-gas discovery hole.

Locations . . . The three locations that have been staked, all within 2 miles of the discovery hole, are situated to the north, west, and south of it. Two of the ventures (the ones to the south and west of the strike) will be carried down to test the same Cardium horizon found productive at that initial hole; while the one to the north will be taken down to evaluate the Mississippian horizon as well.

All of the new tests are on acreage shared equally by the three firms included in the team and on acreage selected out of drilling reservation rights as petroleum and natural-gas lease. In addition to the acreage held in that form, the team, along with Honolulu Oil Corp., also purchased another drilling reservation in the immediate vicinity quite recently. That latter tract, containing 6,821 acres, cost the four companies $1,302,682, or $190.98 per acre. Ultimately, however, after the commitment well is drilled on it (which has not been scheduled as yet) the 1,600 acres of lease available out of it could have a value of $814.18 per acre.



ABOVE is a portion of a new up-to-date map of the Anadarko basin of Oklahoma and Kansas, available from Allstate Map Makers, W. T. Waggoner Building, Fort Worth. This map is posted continuously by the company. Scale is: 1 in. equals 8 miles. Structure contours shown are on top of the Mississippian formation. These Allstate maps show all current active wildcat wells. Discovery wells are shown until the pools are named. Dry holes are removed after 90 days. In view of the increasing campaign throughout the northwestern part of the Anadarko basin, this map is of the utmost help to those watching this province.

Gas pool opens in South Kansas

In southern Kansas, Great Lakes Carbon Co. has a new discovery indicated in Barber County at 1 Rinke, SE SE NE 25-32s-14w. This wildcat is 17 miles southwest of Medicine Lodge.

The well made 4,700 M.c.f.d. from Mississippian at 4,553-72 ft.; 4,572-82 ft. the well made 1,450 M.c.f.d. Location is 1 mile southwest of Palmer field and 2 miles northeast of Elsea gas field.

Alaska test nears slated total depth

Halbouty Alaska Oil Co.'s wildcat adjoining the Swanson River Unit on Alaska's Kenai Peninsula was nearing its projected total depth of 12,000 ft. as the operator reported it drilling ahead below 11,587 ft.

On the Swanson River Unit itself, Standard Oil Co. of California was redrilling at 10,798 ft. on 4A Swanson River Unit. This test was originally taken to 12,582 ft. before being plugged back for the redrill job.

Across the Cook Inlet from Swanson River, Alaska Consolidated Oil Co. was drilling below 6,400 ft. on its 1 Antonio Zappa in the Iniskin Bay region.

Discovery wells

WESTERN CANADA

Alberta: CPOG 6-3-22-15 Verger, LSD 6, 3-22-15w4. Gas discovery. TD 3,595 ft. Kewanee 7-17-27-15 Cessford, LSD 7, 17-27-15w4. Blairmore gas discovery. TD 3,925 ft.

COLORADO

Logan County: Petroleum, Inc. 1 Eisenach, C NW SW 7-7n-52w. IP Shut in gas discovery well. TD 4,530 ft. "J" sand discovery, new field.

Morgan County: Woodward Oil Co. et al. 1 State "A", C NW NE 36-5n-60w. IPP 100 BOPD, D sand; 10 BOPH "J" sand. TD 6,225 ft. "D" sand new pay discovery, dual completion.

ILLINOIS

Jefferson County: Louis Kapp 1 Claude Wilson, NE NE NW 30-1s-3e. IPP 6 BOPD, Rosiclare 2,452-76 ft. TD 2,559 ft. Oil discovery.

KANSAS

Ellis County: Birmingham & Bartlett 1 Kaiser "B," NW SW SE 30-13s-20w. IPP 70 BOPD, 41°, Arbuckle 3,921-26 ft. TD 3,926 ft. Opens Kaiser field on Central Kansas uplift.

Sumner County: White & Ellis and Fred Nixon 1-A Voils, NE NE NE 17-30s-

The April completion score

	TOTAL COMPLETIONS							WILDCAT WELLS							
	Total	Crude	Cond.	Gas	Dry	Service	Footage	Total	Crude	Cond.	Gas	Dry	Footage	C.T.	Act. op.
Alabama	8	8	0	0	0	0	92,231	0	0	0	0	0	0	0	11
Arizona	3	0	0	0	3	0	9,073	3	0	0	0	3	9,073	2	9
Arkansas	58	29	0	3	26	0	192,755	12	0	0	0	12	47,922	0	92
California	124	85	0	5	29	5	495,768	22	1	0	2	19	126,252	0	98
Colorado	60	11	0	0	49	0	335,574	39	3	0	0	36	216,039	0	81
Florida	1	0	0	0	1	0	10,011	1	0	0	0	1	10,011	0	2
Illinois	144	51	0	0	78	15	311,827	31	1	0	0	30	53,618	16	309
Indiana	51	13	0	1	35	2	78,181	20	1	0	0	19	33,075	25	65
Kansas	350	178	3	13	151	5	1,243,943	76	7	0	1	68	286,729	18	430
Kentucky	125	31	0	46	48	0	281,654	4	2	0	0	2	13,729	101	159
Louisiana	272	134	36	14	88	0	2,203,661	28	2	2	0	24	236,409	0	428
North	90	44	1	9	36	0	300,415	12	1	0	0	11	56,322	0	122
South	153	72	32	3	46	0	1,605,724	16	1	2	0	13	180,087	0	255
Offshore	29	18	3	2	6	0	297,522	0	0	0	0	0	0	0	51
Michigan	46	21	0	6	15	4	142,836	7	0	0	0	7	27,230	17	163
Mississippi	54	19	1	0	34	0	496,392	28	3	0	0	25	263,755	0	64
Montana	17	9	0	0	8	0	93,535	6	1	0	0	5	35,679	1	55
Nebraska	68	22	0	0	46	0	418,181	32	1	0	0	31	197,344	0	57
New Mexico	153	99	3	21	30	0	622,249	18	3	1	1	13	83,588	40	198
West	56	26	3	21	6	0	179,809	4	1	1	1	1	28,816	10	100
East	97	73	0	0	24	0	442,440	14	2	0	0	12	54,772	30	98
New York	24	12	0	2	3	7	43,208	4	0	0	1	3	16,036	24	12
North Dakota	44	26	1	0	17	0	283,620	5	2	0	0	3	29,688	0	53
Ohio	83	38	0	24	12	9	235,686	4	2	0	1	1	14,113	83	185
Oklahoma	514	252	14	32	209	7	1,786,461	73	7	4	9	53	366,313	131	803
Pennsylvania	49	12	0	29	3	5	165,482	0	0	0	0	0	0	45	29
South Dakota	1	1	0	0	0	0	8,588	0	0	0	0	0	0	0	2
Tennessee	1	1	0	0	0	0	454	0	0	0	0	0	0	1	2
Texas	1,718	980	63	66	568	41	6,971,137	296	27	4	7	258	1,401,964	.....	1,193
District 1	102	62	1	2	37	0	229,671	22	0	0	0	22	52,948	0	41
District 2	85	23	12	11	39	0	482,067	23	2	1	1	19	138,545	0	62
District 3	113	41	17	5	50	0	844,118	20	0	1	2	17	162,251	0	96
District 4	97	29	9	9	50	0	504,379	24	1	0	1	22	131,501	5	86
East	97	57	8	0	31	1	422,551	16	0	0	0	16	86,994	1	53
District 7-B	278	153	1	6	115	3	713,949	63	14	0	2	47	202,460	0	95
West	507	369	7	4	106	21	2,333,128	69	5	1	0	63	363,151	45	526
District 9	308	164	3	6	121	14	888,422	50	3	0	0	47	203,805	48	119
District 10	131	82	5	23	19	2	552,852	9	2	1	1	5	60,309	0	115
Utah	31	16	0	1	14	0	177,283	11	0	0	1	10	64,084	0	54
West Virginia	59	11	0	42	6	0	137,840	0	0	0	0	0	0	52	198
Wyoming	47	29	0	6	12	0	249,024	9	2	0	1	6	64,937	4	146
April 1959	4,105	2,088	121	311	1,485	100	17,086,654	729	65	11	24	629	3,597,588	659	4,898
March 1959	3,767	1,895	100	276	1,392	104	16,032,887	740	76	13	22	629	3,619,498	670	4,707
Cum. 1959	16,016	8,058	426	1,166	5,950	416	67,483,935	3,074	313	44	104	2,613	15,257,614	2,744	.....
Cum. 1958	14,895	7,447	361	1,146	5,603	338	63,216,112	2,908	271	46	100	2,491	13,681,234	.....	.....

Note: C.T. = cable tool comp., D.D. = O.W.D.D., Act. op. = active operations, D.D. = 41: Ill. 3, Utah 1, Colo. 1, Wyo. 1, Ohio 16, Okla. 13, Texas Penhandle 1, Calif. 3, Dist. (3) 1, Dist. (2) 1.

. . . and in Canada

	ALL WELLS						WILDCATS					
	Total	Oil	Gas	Dry	Footage	Cum. 1959	Total	Oil	Gas	Dry	Footage	Cum. 1959
Alberta	62	29	11	22	417,590	448	17	2	3	12	140,841	144
Saskatchewan	60	36	1	23	250,829	267	18	5	0	13	80,793	98
Manitoba	1	1	0	0	2,050	13	0	0	0	0	0	5
British Columbia	4	0	2	2	28,260	44	4	0	2	2	28,260	38
Northwest Territories	1	0	0	1	2,237	4	1	0	0	1	2,237	4
Western Canada	128	66	14	48	700,966	776	40	7	5	28	252,131	289
Ontario	14	0	5	9	16,208	73	..	..	..	..	.....	.....

1w. IPP 25 BOPD, Mississippian 3,499-3,512 ft., 45°. TD 3,853 ft. Opens Voils field in South Central Kansas basin.

TEXAS PANHANDLE

Hansford County: Shamrock Oil & Gas Corp. 1 J. R. Collard, Sec. 75, Blk. 45, H&TC Sur., 8 miles north and 3 miles west of Spearman. IPP 65.96 BOPD, 39.8°, Kansas City 5,977-83 ft. TD 7,688 ft. Oil discovery.

NORTHWEST NEW MEXICO

San Juan County: Pan American Petroleum Corp. 1 Navajo "C", NW NW 1-29n-17w. IPF 9 M.M.c.f.d, 32/64-in. choke, Paradox discovery, new field. TD 7,026 ft.

NORTH DAKOTA

Burke County: Tom Schwartz 1 Jacob Dewing, SE SE 12-163n-93w. IPF 118 BOPD, 50 BWPD, 3/4-in. choke, Nesson discovery, new field. TD 6,200 ft. Nesson.

another
TRETOLITE SERVICE
report

STOP LOSING OIL DOLLARS!

start treating with TRETOLITE chemicals

TRET-O-LITE* *Demulsifiers*

TRET-O-LITE Demulsifying Chemicals separate a water phase from an oil phase, or vice versa.

Separation procedure consists of injecting and dispersing a small proportion of the proper TRET-O-LITE Demulsifier with the emulsified fluids, then providing suitable storage where oil and water can separate. Because of the large number of problems encountered in treating petroleum emulsions, a large number of chemical demulsifiers have been developed.

TRET-O-LITE* *Chemical Desalting*

TRET-O-LITE Chemical Desalting removes harmful salts from crude oils, and does so in the 95% to 100% efficiency range. It is currently being used to process over 1½ million barrels of crude daily at an average chemical cost of 1.3 mills per barrel.

The Tretolite Company offers a choice of installation plans: Tretolite desalting equipment may be purchased, rented, rented with option to purchase, or constructed by the refiner according to Tretolite design and specifications.

KONTOL* *Corrosion Inhibitors*

These liquid organic semi-polar compounds are available in various formulas, which adsorb on metal surfaces to form an impervious film that inhibits corrosion. This film protects the equipment from corrosive elements in either brine, crude oil, gas or combinations of these. The strength of the bond between the protecting KONTOL film and the metal surface is demonstrated by the fact that protection continues for a substantial period after treatment is stopped.

AP-59-1

SOLVO* *Paraffin Removers*

SOLVO can be injected into oil wells, pipelines, or storage facilities to remove and prevent the accumulation of paraffin. Such deposits often cause sucker rods to stick, requiring shutdown for removal. They also clog lead lines to the point where fluid throughput is seriously reduced. Paraffin settlings rob storage tanks of valuable capacity. SOLVO is useful in removing and preventing such accumulations.

FLUDEX* *Water Flood Additives*

FLUDEX is applicable to the stimulation of injectivity in water flood and water disposal systems. It acts also to prevent corrosion and scale deposition, and to assist in maintaining and restoring the permeability of formations.

S.P. *Scale Preventives*

S. P. Scale Preventives are used in producing wells to prevent the deposition of calcium hardness scales. They prevent damage caused by deposition of scale in oil well tubing, sucker rods, well casing, flow lines, heaters and water-disposal or water-flood systems.

TOLAD† *Fuel Additives*

TOLAD Fuel Additives are ashless, totally oil-soluble compounds designed to enhance the stability of domestic heating oils and diesel fuels, as expressed in color and residue. These additives have excellent water tolerance characteristics in reducing sludge formation and loss to water bottoms in fuel storage. They are available in inhibitor or inhibitor-dispersant formulas.

*TRET-O-LITE, KONTOL, SOLVO *and* FLUDEX *are registered trademarks of Petrolite Corporation.*

†TOLAD *is a Petrolite Corporation trademark, registration pending.*

PETROLITE CORPORATION

TRETOLITE COMPANY
D-I-V-I-S-I-O-N-S
369 Marshall Avenue, Saint Louis 19, Missouri
5515 Telegraph Road, Los Angeles 22, California

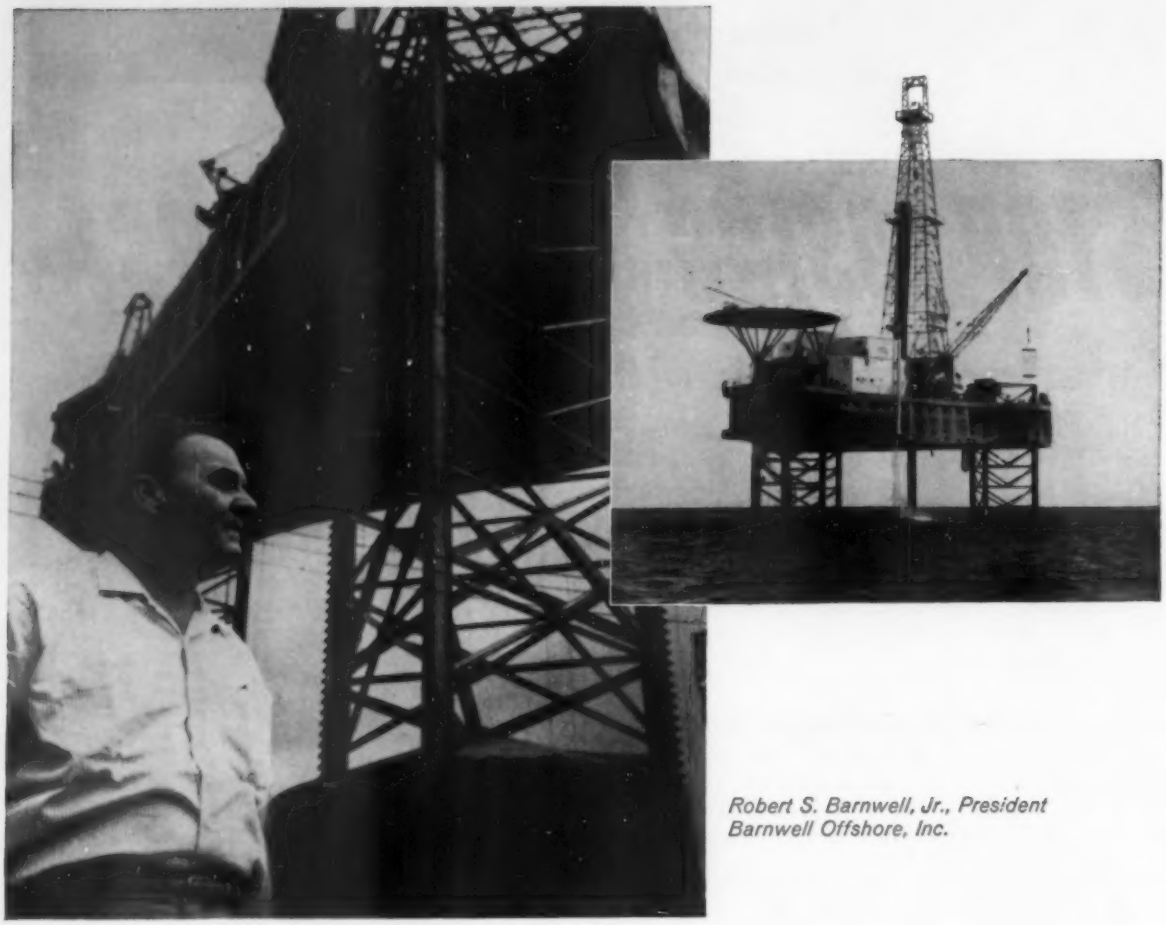
CANADA: Petrolite Corporation of Canada, Limited, 309 Alexandra Bldg., Edmonton, Alberta

ENGLAND: Petrolite Limited, Heathcoat House, 20, Savile Row, London W. 1.

VENEZUELA: South American Petrolite Corporation, Hotel Avila, Caracas

REPRESENTATIVES

BRAZIL: WERCO, Ltda., Avenida Rio Branco 57-s/1410-11, Rio de Janeiro
COLOMBIA: W. F. Faulkner, Calle 19, No. 7-30, Office 807, Bogota
GERMANY: H. Costenoble, Guiollettstrasse 47, Frankfort, a.M.
ITALY: NYMCO S.p.A. 9, Lungotevere A. da Brescia, Rome
JAPAN: Maruwa Bussan KK, No. 3, 2-Chome, Kyobashi, Chuo-Ku, Tokyo
KUWAIT: F. N. Dahdah, Box 1713, Al Kuwait
MEXICO: R. E. Power, Sierra de Mijes, No. 125, Mexico, D. F.
NETHERLANDS: F. E. C. Jenkins, Hoefbladlaan 134, The Hague
PERU: International Gas Lift Company, Apartado 71, Talara
TRINIDAD: Neal and Massy, Ltd., P.O. Box 544, Port of Spain



Robert S. Barnwell, Jr., President
Barnwell Offshore, Inc.

"MR. CAP" stands out in "DRILLING EFFICIENCY"

Barnwell Offshore, Inc., Shreveport, La., has this to say about the performance of their LeTourneau built mobile offshore drilling platform: "More and more it appears that *efficiency of equipment* and *economy of operation* are the primary requisites to obtain offshore drilling contracts. And, since 'Mr. Cap' possesses both of these to a high degree, our position improves with each hole we drill and our reputation gains accordingly.

"All told 'Mr. Cap' has proven to be a remarkable piece of drilling equipment, and to date has had no breakdowns, slow-ups or retarded drilling of any kind; and in addition, it has extreme mobility from location to location. Altogether, 'Mr Cap' has proven to the major companies for which it has drilled that it is a rig to depend on."

R. G. LeTourneau, Inc. designs and builds self-contained and tender-assisted Mobile Offshore Drilling Platforms to individual customer requirements. Inquiries are welcome and held strictly confidential. Write 2865 South MacArthur.

R.G. LETOURNEAU INC

LONGVIEW, TEXAS

M-116

April footage account for U. S.

	FIELD WELLS					WILDCAT WELLS			
	Oil	Cond.	Gas	Dry	Service	Oil	Cond.	Gas	Dry
Alabama	92,231	.....	.....	.....	.....	.....	.....	.....	.....
Arizona	.....	.....	.....	.....	.....	.....	.....	.....	9,073
Arkansas	80,714	.....	15,766	48,353	.....	.....	.....	.....	47,922
California	281,585	.....	16,655	49,331	21,945	4,260	.....	9,310	112,682
Colorado	43,848	.....	.....	75,687	.....	16,090	.....	.....	199,949
Florida	.....	.....	.....	.....	.....	.....	.....	.....	10,011
Illinois	115,421	.....	.....	116,913	25,875	2,869	.....	.....	50,749
Indiana	18,385	.....	878	24,144	1,699	1,556	.....	.....	31,419
Kansas	576,770	17,685	50,416	297,408	14,935	29,902	.....	4,235	252,592
Kentucky	47,717	.....	147,723	72,485	.....	2,522	.....	.....	11,207
Louisiana	961,778	422,550	90,918	492,006	.....	17,856	23,841	.....	194,712
North	97,561	8,750	44,092	93,690	.....	6,800	.....	.....	49,522
South	662,367	376,743	22,362	364,165	.....	11,056	23,841	.....	145,190
Offshore	201,850	37,057	24,464	34,151	.....	.....	.....	.....	.....
Michigan	69,361	.....	12,939	22,746	10,560	.....	.....	.....	27,230
Mississippi	133,642	11,004	.....	87,991	.....	35,025	.....	.....	228,730
Montana	42,046	.....	.....	15,810	.....	9,684	.....	.....	25,995
Nebraska	131,980	.....	.....	88,857	.....	6,803	.....	.....	190,541
New Mexico	391,428	13,150	69,775	64,308	.....	13,504	6,389	6,462	57,233
New York	15,252	.....	2,600	.....	9,320	.....	.....	3,299	12,737
North Dakota	158,040	11,725	.....	84,167	.....	10,234	.....	.....	19,454
Ohio	109,479	.....	56,977	30,868	24,249	6,246	.....	4,610	3,257
Oklahoma	796,697	68,360	113,701	423,730	17,660	48,703	31,607	62,893	223,110
Pennsylvania	22,106	.....	127,452	9,674	6,250	.....	.....	.....	.....
South Dakota	8,588	.....	.....	.....	.....	.....	.....	.....	.....
Tennessee	454	.....	.....	.....	.....	.....	.....	.....	.....
Texas	3,485,830	515,631	241,732	1,224,630	101,350	128,851	28,635	36,878	1,207,600
Dist. 1	109,574	11,200	6,067	49,882	.....	.....	.....	.....	52,948
Dist. 2	100,355	84,350	55,505	103,312	.....	14,818	7,125	4,133	112,469
Dist. 3	268,380	174,237	20,485	218,765	.....	.....	10,500	10,942	140,809
Dist. 4	122,072	64,604	39,647	146,555	.....	11,864	.....	10,500	109,137
East	194,153	65,059	.....	73,685	2,660	.....	.....	.....	86,994
Dist. 7-B	322,639	4,220	11,058	168,140	5,432	49,038	.....	8,158	145,264
West	1,652,407	53,603	11,926	196,141	55,900	24,078	3,810	.....	335,263
Dist. 9	402,890	24,927	35,966	186,954	33,880	12,853	.....	.....	190,952
Dist. 10	313,360	33,431	61,078	81,196	3,478	16,200	7,200	3,145	33,764
Utah	91,621	.....	.....	21,578	.....	.....	.....	5,515	58,569
West Virginia	22,886	.....	100,615	14,339	.....	.....	.....	.....	.....
Wyoming	119,351	.....	38,095	26,641	.....	16,132	.....	6,202	42,603
Total U. S.	7,817,210	1,060,105	1,086,242	3,291,666	233,843	350,337	90,472	139,404	3,017,375
Western Canada	295,222	.....	42,908	110,705	.....	37,200	.....	35,386	179,545
Alberta	167,751	.....	40,624	68,374	.....	17,073	.....	19,416	104,352
Saskatchewan	125,421	.....	2,284	42,331	.....	20,127	.....	.....	60,666
Manitoba	2,050	.....	.....	.....	.....	.....	.....	.....	.....
British Columbia	.....	.....	.....	.....	.....	.....	.....	15,970	12,290
Northwest Territories	.....	.....	.....	.....	.....	.....	.....	.....	2,237

LEGAL

SEALED BIDS will be received until 2:00 P. M. CST June 9, 1959, and opened at that time in the office of the Fort Berthold Indian Agency, New Town, North Dakota, for the leasing of 28,426 acres of allotted Indian land and 1,148 acres of Tribal land located in McKenzie, Dunn and Mountrail Counties, North Dakota, for oil and gas mining purposes. The details of the lease offering and how and where to file bids may be obtained by addressing the inquiry to the Superintendent of the Fort Berthold Indian Agency at New Town, North Dakota or call MAin 7-4340.

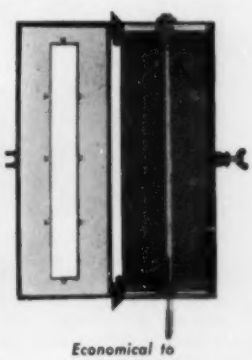
LEGAL

SEALED BIDS will be received until 10:00 A. M., Mountain Standard Time, June 9, 1959, and opened at that time at the Fort Peck Indian Agency, Poplar, Montana, for the leasing of 29 tracts of Tribal land comprising 5,398.54 acres and 111 tracts of individually owned trust or restricted Indian Lands comprising 19,956.94 acres located in Sheridan & Daniels Counties, Montana and Williams County, North Dakota, for oil and gas mining purposes. The details of the lease offering and how and where to file bids may be obtained by addressing the inquiry to the Superintendent, Fort Peck Indian Agency, Poplar, Montana, or telephone, Poplar PO 8-3441.

A NEW AND BETTER LIQUID LEVEL CONTROLLER

For controlling high and low levels in a variety of tank operations. *Especially ideal for surge tanks on lease automatic custody transfer units.* Easy to install . . . fully automatic . . . maintenance-free!

PHIL-MAG

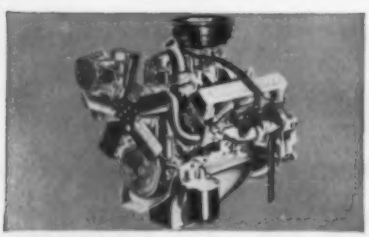


Economical to Buy and Operate

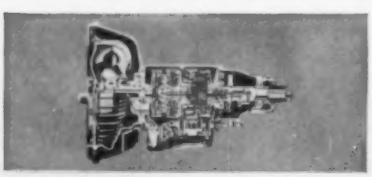
WRITE FOR DESCRIPTIVE LITERATURE

Enardo Manufacturing Company BOX 1647 TULSA

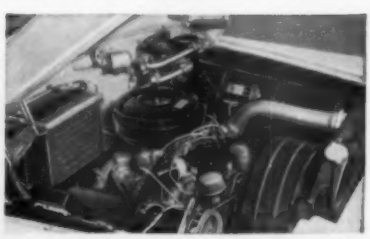
Where trucks take punishment, this INTERNATIONAL pickup (right) with optional V-8 power gives you ruggedness and ability! Choose from two body types—extra-wide, extra-capacity "Bonus Load" or standard. Low-to-ground pickup design makes for convenient load accessibility—bodies are reinforced with box-type construction and all-steel ribbed floor. INTERNATIONAL Trucks give you everything for comfort, from new instrument panel to accelerator pedal!



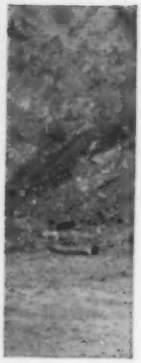
Harder working! Low-stress 345 cu. in. V-8 engine is proved to operate at maximum rpm. By-pass cooling and alternating valve system give long compression life. Special contour piston and combustion chamber creates high turbulence and even burning.



Surer working! INTERNATIONAL Trucks Select-O-Matic semi-automatic transmission torque converter is designed around major components of precision cast aluminum. Mirror smooth hard shell surfaces provide over 90% efficiency...intake oil filter assures they stay that way. IMPORTANT! Conventional design gear setup simplifies maintenance for any mechanic.



Easier servicing! New V-8 engine is only 31 in. long. Smart placement makes every component readily accessible. Faster availability of parts and service from a nation-wide network of dealers and factory-owned branches gives you what you need promptly.



ROUGH JOBS, ANY JOBS,

INTERNATIONAL TRUCKS HELP YOU WITH ALL OF THEM!

Try an INTERNATIONAL V-8 powered truck in your operation. This action-designed "smotherer unit" for instance. You get the newest, most advanced combination of V-8 engine and semi-automatic transmission in the truck business.

Husky, all-truck V-8 engine options range from 266 to 345 cu. in. displacement . . . give you a power selection that mates truck to job . . . a power plant that has a down-to-earth oil field operating range with both fast response and pulling brawn!

Optional INTERNATIONAL Select-O-Matic semi-automatic transmission takes this power and tames it so that any driver has complete control, gets a smooth application of power with high efficiency no matter what the conditions.

New INTERNATIONAL single and tandem-axle models from 4,200 to 33,000 lbs. GVW help do your job faster and better. Other models up to 100,000 lbs. GVW—your INTERNATIONAL Dealer can give you more details. See him today!

International Harvester Company, Chicago
Motor Trucks • Crawler Tractors
Construction Equipment • McCormick®
Farm Equipment and Farmall® Tractors

INTERNATIONAL® TRUCKS WORLD'S MOST COMPLETE LINE

RING OF STEEL

Defies Pressure Times Ten

The Flexitallic gasket in the bonnet joint of Hancock Steel Gate Valves cannot blow out even if pressures exceed ten times the rating of the valve. Valve maintenance and equipment down-time are greatly reduced. Made of a spiral-wound ribbon of stainless steel with asbestos filler, the gasket has spring-like compressibility — cannot be flattened.

Only the specially-designed Hancock bonnet joint with built-in compression limit can make full use of the positive sealing power of this ring of steel. Such advanced valve engineering is one example of total Hancock quality that assures trouble-free performance. Your nearby industrial supply distributor will gladly explain every economy feature of Hancock Steel Gate Valves. Phone him today.

Hancock 800# Steel Gate Valve, Type 950. Sizes: ¼" thru 2".

HANCOCK STEEL VALVES

A product of

MANNING, MAXWELL & MOORE, INC.

Consolidated Ashcroft Hancock Division • Watertown, Massachusetts
In Canada: Manning, Maxwell & Moore of Canada, Ltd., Galt, Ontario

Sunray Gets a Youthful Look

. . . as Paul Taliaferro takes over presidential reins. He is a lawyer who has a secret yen to be an oil explorer.

WHEN Paul E. Taliaferro moved into the president's office a few days ago, it marked another major step in the "youth movement" in the executive ranks of Sunray Mid-Continent Oil Co.

At 53, Taliaferro succeeds William C. Whaley, who became eligible for retirement this spring. His key vice presidents also are executives in their mid-40s or early 50s with many years of peak activity still ahead.

Taliaferro, however, is an "old timer" in Sunray executive ranks. He's been with the company 27 years. Several of his top assistants also have "grown up" in the company. And their experience will still be supported by three veterans: C. H. Wright, Sunray board chairman; R. W. McDowell, vice chairman of Sunray and president of the marketing subsidiary, D-X Sunray Oil Co.; and Whaley, who is remaining with the company as a director and chairman of the executive committee.

In announcing Taliaferro's election as president, Wright plainly said it recognizes "Taliaferro as a younger man with long executive experience in the company." He added the move is in keeping with Sunray's long-range plan to build and strengthen its management leadership.

Wright declared that "with Paul Taliaferro as president and the other senior officers and executives who will work with him, the Sunray family of companies is in an enviable position to perpetuate its management operations with capable personnel in all divisions."

No revolution . . . The genial, slow-speaking Taliaferro is the first to declare that his election will not mark any shake-up in Sunray policies.

"As an officer of the company since 1934, I have had a part in hiring most of the departmental executives around me, he said. "I've either had a hand in developing company policies and programs now in effect or have helped direct them."

Paul E. Taliaferro

. . . prefers a balanced growth.

"So you can see that my big immediate task is to see that projects already started are completed successfully. There'll be no revolution in the company."

As for the future, Taliaferro emphasized that industry trends probably will point out the course to take. He added, however, that he wants to direct the company's growth along a balanced, integrated path.

"In the past, chief emphasis in oil operations at various times has been on exploration and production and then on refining," he recalled. "Right now the chief concern of nearly all oil companies is on marketing. We have to sell the oil we find, produce, and then grind up into products.

"That's why outlets for products are so vital now to oil companies. It is the drive behind the constant acquisition of new marketing outlets," he said.

Taliaferro said the preoccupation with marketing doesn't mean any other aspect of the business will be neglected.

"We're in an excellent quality position in refining and intend to keep it. We plan to continue our search for oil both in this country and abroad," he declared.

Bit of glamor . . . Taliaferro is a trained lawyer whose executive experience has taken him into all branches of the oil industry.

The new Sunray president, however, admits that if he had to choose a branch of the industry in which to work he would go into production or exploration.

"It's the most interesting, most glamorous part of the oil business," Taliaferro says with a smile. "Many other jobs become routine, but there's nothing ever routine about finding oil."

Taliaferro is a native of Denton, Tex., and was graduated there from high school and also North Texas State College, receiving a bachelor of arts degree in 1926. In 1930 he received an LL.B. degree from the University of Tulsa, and joined Sunray the next year as its general attorney.

Taliaferro has served the company as executive vice president since 1952, as a director since 1946, and earlier as a vice president, assistant to the president.

He also serves on the boards of a bank, insurance companies, and other corporations. He is active in civic and philanthropic organizations and in oil-industry groups. He resides with his wife Irene and two children, Bruce Owen and Mary Ann, in Tulsa's far south side.

▶ ▶ ▶ Personals

W. H. Barlow, manager of research and planning; **G. F. Bish,** vice president and manager of domestic production; and **C. A. Jackson,** treasurer, have been elected to the board of directors of Ohio Oil Co. Barlow has been research manager since 1954 and manager since February this year. He joined Ohio in 1942 as a petroleum engineer in the Tulsa division. Bish was assistant manager of domestic production for 5 years before moving up to vice president in charge of the department on May 1. Jackson has been treasurer since 1954.

Dr. Bernardo F. Grossling has been named research associate in geophysics at California Research Corp.'s La Habra, Calif., laboratory. Grossling joined the company at La Habra in 1954. He was a senior consultant with Empresa Nacional de Petroleo, government oil agency in Chili, before that time.

Kent Dixon, geologist with Cities Service Oil Co., has been transferred to El Dorado, Kans., from Olney, Ill.

G. M. Schuchardt, senior geophysicist in New Orleans for Sinclair Oil & Gas Co., has been promoted to district geophysicist in Lafayette, La.

▶ ▶ ▶ Personals

Arthur W. Winter, assistant to the president of Great Northern Oil Co., St. Paul, has been elected a vice president of the company. Winter joined Great Northern in 1957. A graduate of Carleton College, he is a former president of the old Roosevelt Oil & Refining Co., Mount Pleasant, Mich., now Roosevelt division of Leonard Refineries, Inc.

E. B. (Ed) Thompson, manager of retail sales in the Oakland, Calif., division of Standard Oil Co. of California, has been appointed manager of foreign trade. He succeeds the late W. C. Lane.

Rufus T. Burton, regional vice president in Standard-Vacuum Oil Co.'s White Plains, N.Y., office in charge of company interests in Australia and New Zealand, and **Willem Holst,** manager of the economic coordination department, have been elected directors of the company.

W. T. Kennedy, Los Angeles division superintendent of production for Ohio Oil Co. since 1952, has been named operations manager for Oasis Oil Co. of Libya, subsidiary of Ohio, in Tripoli, Libya. **R. C. Farley,** present

KENNEDY

FARLEY

operations manager in Libya since 1957, will succeed Kennedy in Los Angeles. The change is part of a rotation program which will give Ohio Oil's domestic production staff foreign experience.

Paul Siecke, director of process design for Gulf Oil Corp. in Pittsburgh, has been named general manager of the company's Cincinnati refinery. He succeeds **Thomas F. Hogan,** who is retiring. Siecke had held the Pittsburgh post since 1955. He will be succeeded there by **Lathan J. Lashley,** section head in the process design division, Pittsburgh.

Richard S. Johnson, engineer with Carter Oil Co. in Durango, Colo., has joined Honolulu Oil Corp. in Cody, Wyo., as engineer.

Frank C. Pfeiffer, Jr., field engineer for Magnolia Petroleum Co. in Alice, Tex., has been named plant engineer at Magnolia's Opelousas, La., cycling plant.

Dwayne E. Godsey, petroleum engineer in Houston for Tennessee Gas & Oil Co., has been promoted to district petroleum engineer in Great Bend, Kans.

J. H. Markley, division manager for Texaco, Inc., in Fort Worth, has been transferred to Midland, Tex., as part of a move which will set up division headquarters in Midland June 1.

William E. Fickert, formerly with Orchem Corp., has joined Ryder Scott Co. Petroleum Engineers, Wichita Falls, Tex., as reservoir engineer. **Gordon T. West, Jr.,** has joined the company as petroleum engineer.

Frank Dorr, Jr., formerly with Ebasco Services, has joined Columbia Gulf Transmission Co. as project engineer. **Howard S. Wright,** formerly district pipeline engineer for Gulf Oil Corp., has joined Columbia Gulf as engineer.

Robert H. Harkins, assistant to the vice president in charge of operations in Kansas City for Panhandle Eastern Pipe Line Co., has been named general manager of gas production and supply in Liberal, Kans. He succeeds **George B. McClellan,** who has resigned.

M. S. Beringer has retired as chairman of the board of British American Oil Co., Ltd., but will continue as a director of the company. Beringer was manager of refineries and vice president in charge of manufacturing for B-A before being elected chairman in 1951. He served as chairman and president from 1955 to 1958, when he stepped down as president.

A. L. Vaughan and **W. B. Haas** have been elected vice presidents of Northern Natural Gas Co. Vaughan is in charge of operations in the company's southern region, and Haas in charge of the northern region. Each was general manager of his division before being elected vice president. **J. O. Grantham,** manager of employe relations, was elected a vice president in charge of the department.

Neal H. Potts, formerly in charge of the Oklahoma City office of William Ross Cabeen & Associates, has been transferred to Roswell, N. M., as manager and coordinator of the southwest area.

M. E. Gillis has been promoted to senior chemical engineer in the technical division at Humble Oil & Refining Co.'s Baytown, Tex., refinery. Gillis handles projects involving butyl rubber production.

S. M. Batterson, vice president of Macmillan Petroleum Corp., has been elected president. He succeeds **R. S. Macmillan,** founder of the company, who has taken a leave of absence because of illness. **Donald H. McKee,** McKee & Co., Los Angeles, has been elected a director of Macmillan.

ADAIR

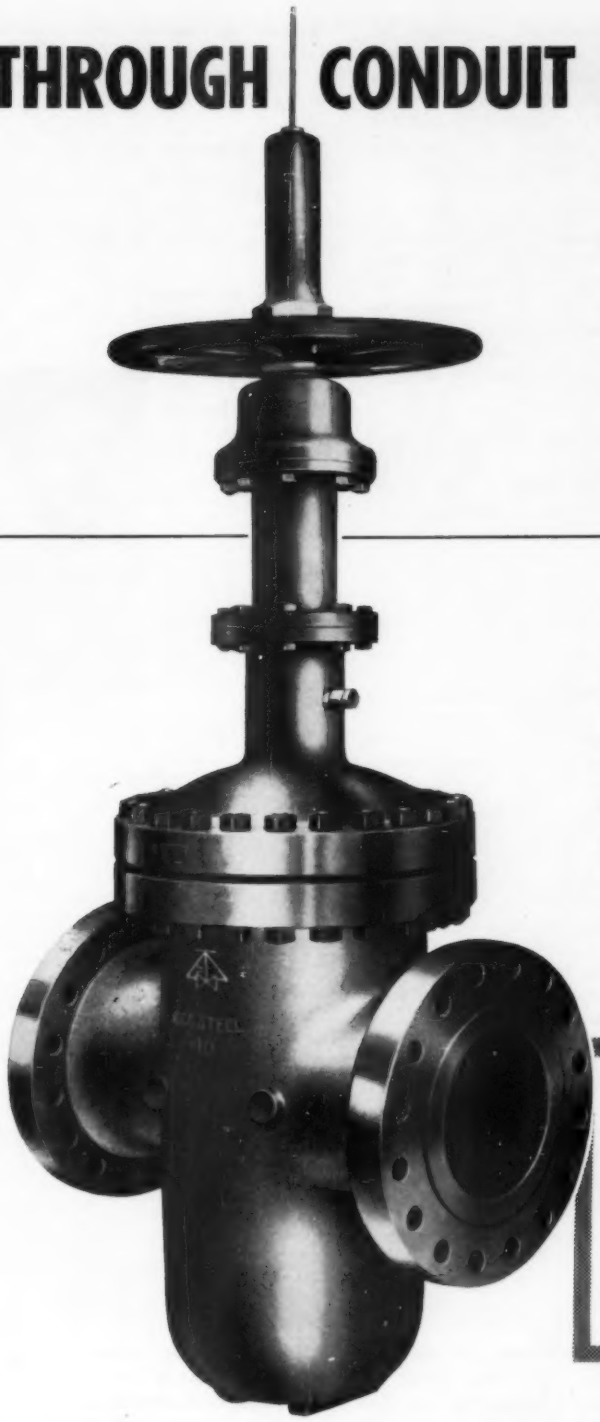
Paul N. (Red) Adair, for many years top assistant to fire fighter **Myron Kinley,** has formed his own well control and oil well fire fighting company, Red Adair Co., Inc., Houston. Adair had been with M. M. Kinley Co. for 12 years. He shared headlines with Kinley on many of oil's best known fires and blowouts since he usually took over management of one operation if two serious fires were in progress.

G. A. Olsen, Sunland Refining Co., has been elected president of Independent Refiners Association of California. He succeeds **George T. Goggin,** Douglas Oil Co. of California, who has headed IRAC since 1956.

Otto Fraenzel and **Dr. Hasso von Wedel,** both of Hamburg, have been named managing directors of Oberrheinische Mineraleolwerke GmbH., a new company formed by five West German refiners to operate a proposed, jointly-owned refinery at Karksruhe.

Dan L. Mayer, assistant manager of Phillips Petroleum Co.'s natural-gas department, has moved up to manager of the department. He succeeds **R. B. Stewart,** who was recently promoted to vice president, natural gas. A graduate of the University of Oklahoma, Mayer joined Phillips in 1932. He was general superintendent of the natural-gas department before becoming assistant manager in 1956.

THROUGH CONDUIT PIPELINE VALVE

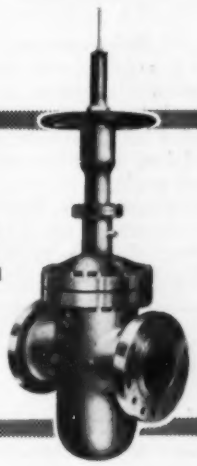


The illustrations show the Triangle Cast Steel Through-conduit Pipeline Valve (Figure Nos. 18122, 38122 or 68122) which is made in sizes from 6″ to 30″ for maximum cold working pressures as follows:

	CWP	TEST PRESSURES
Class 150 :	275 p.s.i.	425 p.s.i. water
Class 300 :	720 p.s.i.	1100 p.s.i. ″
Class 600 :	1440 p.s.i.	2200 p.s.i. ″

all above tested 100 p.s.i. air with seat under water.

This series of valves is only one of the very wide range of valves in cast carbon steel, cast alloy steel, drop forged steel and cast iron made by this Company to cover the petroleum, chemical and general industries.
Larger size valves can be fitted with a flange suitable for mounting standard actuators or bevel gears as illustration on left.
Full details will gladly be supplied on application.



✻ All these valves can be supplied with butt welded ends if so required and with bevel gears, spur gears or power actuator in place of the handwheel.

TRIANGLE VALVE CO. LTD.

LONDON OFFICE: P.O. BOX No. 78 · CANBERRA HOUSE · 315-7 REGENT STREET · LONDON W.1 · ENGLAND

Telephones: LANgham 6526-7. Telegrams: Trivalon, London, Telex. Cables: Trivalon, London, Telex. Telex: 24-100

WORKS: LAMBERHEAD GREEN · WIGAN · LANCASHIRE · ENGLAND

TV4

Personals

Lawrence Dronberger, assistant chief mechanical engineer at Cities Service Oil Co.'s Ponca City, Okla., refinery, has been promoted to mechanical superintendent. He succeeds **J. J. Twohig,** who has retired. A graduate of Oklahoma State University, Dronberger has been with Cities Service since 1943. In other Cities Service changes at Ponca City, **R. D. Walker** has been named field supervisor. **Forrest R. Overman,** supervisor of the instrument and electrical department, has been named general craft supervisor. **A. B. Benson** has been appointed planning and scheduling supervisor, and **H. E. Cooke** becomes instrument and electrical foreman.

DRONBERGER

Claude H. Guinn, natural-gas engineer with Texaco, Inc., in Salem, Ill., has been transferred to Houston in the same capacity.

R. E. Pfaff, Jr., Pan American Petroleum Corp. production engineer in Lake Charles, La., has been promoted to reservoir engineer and transferred to New Orleans.

L. W. Hammond and **F. B. Boucher** have joined California Research Corp. as research engineers in process and plant design at the company's Richmond, Calif., laboratory. **D. A. Saville** has joined the Richmond lab as research engineer in petroleum process development. **J. B. Bagger** has joined the company as research chemist, oil recovery division, at the La Habra, Calif., laboratory.

Stanley Learned, chairman of the executive committee and assistant to the president of Phillips Petroleum Co., will be honored June 1 by a University of Kansas citation for distinguished service to mankind. Learned is a 1924 graduate of the university.

James Harrop, general superintendent of Humble Oil & Refining Co.'s Baytown, Tex., refinery, has retired. A graduate of Massachusetts Institute of Technology, Harrop was the company's first chemical engineer when he joined Humble in Baytown in 1922.

John E. Blazier, formerly project and estimating section head in Barrancabermeja, Colombia, for International Petroleum (Colombia), Ltd., a subsidiary of International Petroleum Co., Ltd., has been given a rotational assignment as budget and estimating engineer with Standard Vacuum Oil Co. in White Plains, N. Y.

H. A. Nedom, Amerada Petroleum Corp., Tulsa, has been elected chairman of the Mid-Continent district of API's Division of Production. He succeeds **Wayne Moody,** Sunray Mid-Continent Oil Co. **W. E. Barfield,** S. M. Jones Co., has been elected secretary-treasurer of the group. Newly elected vice chairmen include **Frank Anderson,** Texaco, Inc., vice chairman for Seminole-Oklahoma City area; **J. C. Curry,** Continental Oil Co., for Kansas; **E. R. Frazier,** Magnolia Petroleum Co., Drumright-Perry area; **W. A. Watson,** Humble Oil & Refining Co., Texas Panhandle; **J. F. Cox,** Pan American Petroleum Corp., southern Oklahoma; and **P. G. Rennie,** Sohio Petroleum Co., Golden Trend area. **J. R. Hatfield,** Cities Service Oil Co., has been named chairman of the district advisory committee.

Richard J. Goeken, area engineer for Gulf Oil Corp. in Triumph, La., has been promoted to senior petroleum engineer in New Orleans.

T. M. Whittaker, production engineer for Trigood Oil Co. in Fiddler Creek, Wyo., has joined Tennessee Gas Transmission Co. as production engineer in Hobbs, N. M.

George P. Mitchell, executive vice president of Christie, Mitchell, & Mitchell Co., Houston, has been elected president. He succeeds his brother, **Johnny Mitchell,** who becomes vice chairman of the board. George Mitchell has been in charge of geological and engineering functions of the company since its formation. A graduate of Texas A. & M. College, he was with Pan American Petroleum Corp. and did consulting work before helping organize Christie, Mitchell & Mitchell in 1946.

G. P. MITCHELL

Dr. J. H. Raley, research supervisor at Shell Development Co.'s Emeryville, Calif., research laboratories, has been given a year's assignment at Shell laboratories in Amsterdam. **J. C. Dygert,** engineer in the mechanical and electrical engineering department at Emeryville, has been given a similar assignment in The Hague.

Omar O. Juveland and **Richard H. Baldwin** have been named group leaders at the Whiting, Ind., research laboratory of Standard Oil Co. (Ind.). Juveland's group will do exploratory research in plastics. Baldwin will head a group studying design and economics for new large-scale chemical and plastics processes.

Deaths

Harvey Ellis Davidson, 55, chief engineer of Bethlehem Steel Co., supply division, died May 14 in a Tulsa hospital after a 2-week illness. Davidson had been with Bethlehem since 1941. He was a graduate of Kansas State University.

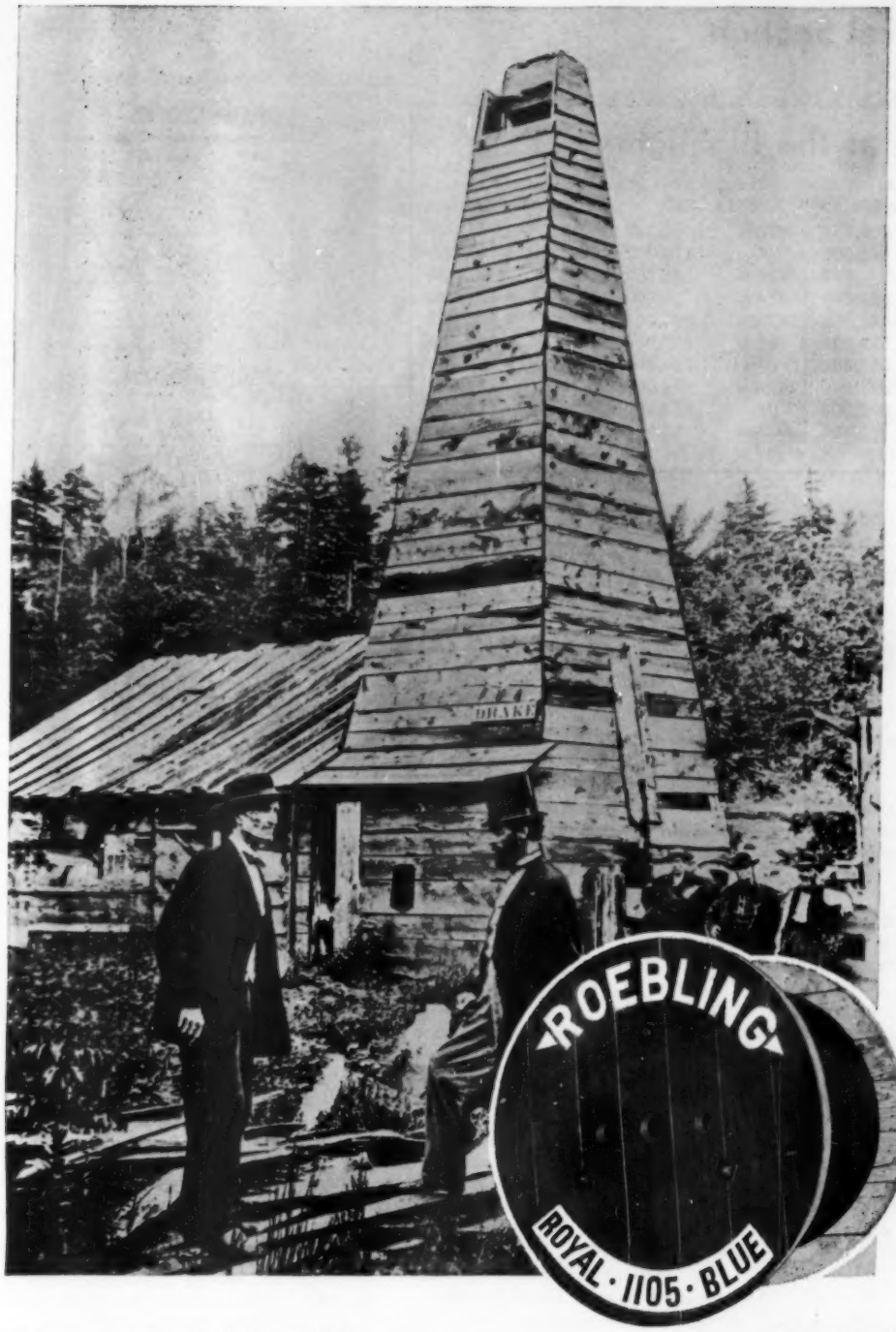
Thomas Newton Asbury, 79, former chairman of the old Seaboard Oil Co., died May 17 at his home in Houston. Asbury had been in the oil business since 1894 when he joined the old Waters-Pierce Oil Co.

Henry N. Schramm, president of Schramm, Inc., died May 12 at his home in West Chester, Pa. He had been with the company since 1900 and had been president since 1925.

Myron C. Taylor, 85, former chairman of U. S. Steel Corp., died recently in New York. Taylor was appointed presidential representative to the Vatican in 1939 after his retirement as U. S. Steel chairman. He retired as a director of the company in 1956.

Houston Strong, assistant foreman with Sinclair Oil & Gas Co. in Stonewall, Okla., died recently in Stonewall. Strong had been with Sinclair and predecessor companies since 1920.

Thomas D. Tifft, former chief engineer of Sinclair Refining Co., died May 18 in Carmel Valley, Calif. Tifft, 68, retired in 1956. He had been with Sinclair since 1920 and was well known for his role in establishing the industry's pressure vessel code.



It has always been in the picture

Wire rope and oil tell closely parallel stories of growth and progress; so close, in fact, that one story is incomplete without the other. Virtually from the beginning, Roebling's role in petroleum production has been significant in that we have manufactured and supplied the finest wire rope available at any given time during most of the first fantastic hundred years of oil.

Look at the amazing strides. Sixty-nine ft hole in 1859! 25,000 ft in 1959!

OIL'S FIRST CENTURY
-BORN IN FREEDOM
WORKING FOR PROGRESS

And Roebling is right in step. Today, it is Roebling Royal Blue Wire Rope, the strongest, toughest rope ever produced. Made from Type 1105, extra high-strength improved plow steel rope wire, Royal Blue *delivers* on the job. Its extra resistance to abrasion, shock, impact, crushing and fatigue combine to give it a 15% higher catalog strength than standard wire rope.

As for the next hundred years? Well, whatever the Trade Name of the Roebling rope being used, you can be sure that it will be the best rope *for the job.*

ROEBLING

Branch Offices in Principal Cities
Subsidiary of The Colorado Fuel and Iron Corporation

A quick look at the highlights . . .

	LATEST WEEK	Change from WEEK AGO		Change from YEAR AGO	
Production	7,200,765	DOWN	3,140	UP	954,609
Crude stocks	255,845,000	UP	818,000	DOWN	18,187,000
Completions	875	DOWN	153	UP	53
Refinery runs	7,684,000	DOWN	38,000	UP	205,000
Gasoline stocks	206,616,000	DOWN	1,803,000	UP	8,309,000
Kerosine stocks	22,513,000	UP	897,000	UP	2,207,000
Distillate stocks	89,639,000	UP	1,984,000	UP	8,868,000
Residual stocks	54,629,000	DOWN	924,000	DOWN	4,874,000
Four-product stocks	373,397,000	UP	154,000	UP	14,510,000
Total imports	1,323,700	DOWN	50,300	UP	50,400

Increased storage will permit record LPG stocks

BY JOHN C. CASPER

STOCKS OF LPG are at a peak for this time of year but there seems to be plenty of storage space for the summer surplus.

Propane accounts for a large portion of total LPG inventories. The chart on this page gives a picture of seasonal and annual changes in total stocks of propane since 1956.

Note on the chart that there is a break in the line representing stocks for 1958. Starting with August last year, the Bureau of Mines shifted reporting to a new basis to eliminate nonrecoverable stocks of LPG in underground storage.

The net result from this change was a bookkeeping reduction in propane stocks at the end of July amounting to almost 22 million gallons. Total stocks of LPG were cut 59 million gallons.

Subnormal stocks . . . On this revised basis, propane stocks at the end of March last year amounted to slightly less than 69 million gallons at plants and terminals plus 28 million gallons at refineries. Data for the first half of 1958, as shown on the chart, are on the old basis for comparison with previous years.

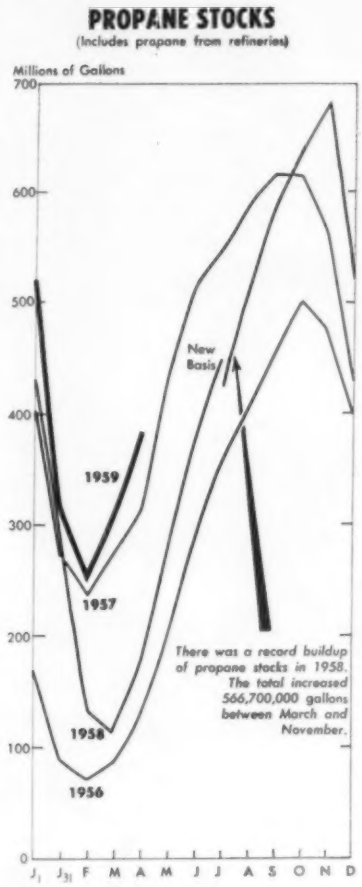
Note that the low point last year came at the end of March when propane stocks on the old basis amounted to only 119 million gallons. Cold weather and the resulting high demands for LPG produced an abnormal stock change in March. End-of-quarter stocks were 159 million gallons less than they were a year earlier and only 3 million gallons more than the total reported for March 31, 1955. Also the total for the end of March was only 30 million gallons higher than in 1954.

These comparisons and the lines on the chart established a basis for measuring current stocks. For the early months of this year, you can not evaluate the current stock level by comparing it with stocks on the same date last year. Nor can you get a true picture from a comparison with data for 1957. Stocks were a little high for the first 4 months of 1957 and low in 1958.

The average February - November increase in propane stocks for the past 5 years has been about 335 million gallons.

Record stock gain . . . Operators set a big record in 1958. They added more propane to storage in the off season than ever before. From the first of April to the end of November there was a steady climb in stocks for a net addition of 566.7 million gallons.

Stock records indicate that all of this increase was in propane. In fact, stocks of other light products declined slightly for the period. The increase for total LPG and LRG was 530 million gallons.

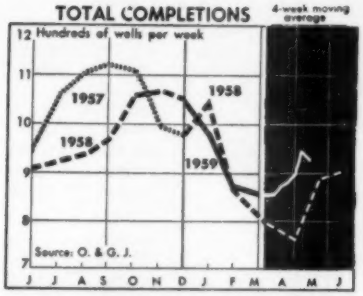


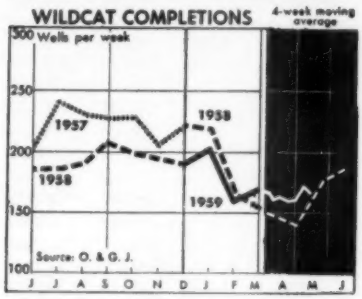
Total light-product stocks reached a low of 468 million gallons at the end of February this year. If the summer increase is the same as it was last year, total light product stocks could top the billion-gallon mark by the end of November.

Storage half filled . . . But there will be plenty of storage space for these products. From September 1956 to September 1958. underground-storage capacity almost doubled. The Oil and Gas Journal's survey last fall showed total capacity of 1.8 billion gallons completed or under way. In addition, the Bureau of Mines reports about 200 million gallons of storage space aboveground at plants and terminals. Adding the pressure storage at refineries, brings total capacity a little above 2 billion gallons.

There will be plenty of room for this summer's surplus.

DRILLING





Active Rotary Rigs

	5-18-59	5-11-59	5-19-58
Alabama	7	7	5
Arkansas	10	12	13
Arizona	2	1	0
California	96	98	86
Land	92	94	(†)
Offshore	4	4	(†)
Colorado	47	26	26
Florida	3	3	2
Land	2	2	1
Offshore	1	1	1
Illinois	39	42	54
Indiana	9	10	8
Iowa	3	3	3
Kansas	130	146	114
Kentucky	9	9	6
Louisiana	347	346	277
North	31	30	34
S.-Inland waters	150	150	(‡)
S.-Land	114	121	202
Offshore	52	45	41
Maryland	0	0	0
Michigan	23	22	11
Mississippi	63	55	33
Missouri	1	0	0
Montana	20	22	22
Nebraska	20	26	23
Nevada	0	0	0
New Mexico	117	106	131
New York	1	1	2
North Dakota	39	40	37
Ohio	3	3	0
Oklahoma	234	247	190
Oregon	0	0	1
Pennsylvania	10	12	10
South Dakota	2	2	0
Texas	775	795	646
S.-Inland waters	4	6	(‡)
S. Land	204	185	144
Offshore	0	0	4
North-East	143	176	(†)
West Central	267	273	(†)
West	157	155	(†)
Utah	25	26	38
Washington	0	0	0
West Virginia	7	7	6
Wyoming	74	71	48
Total U. S.	**2,116**	2,138	1,792
Western Canada	124	121	128
Eastern Canada	0	0	2
Grand total	2,240	2,259	1,922

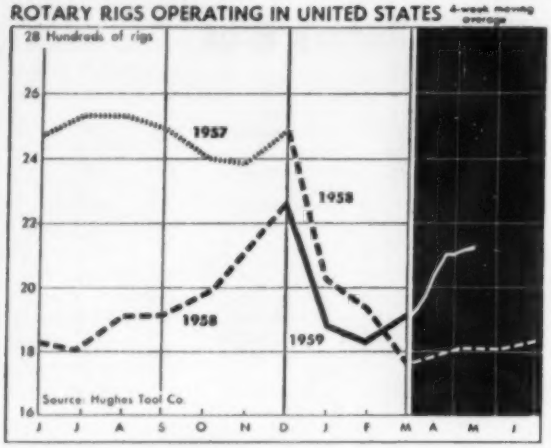
Hughes Tool Co. †Comparisons not available due to change in method of reporting. ‡Included in South-Land.

WEEKLY WELL COMPLETIONS . . . WEEK ENDED MAY 16, 1959

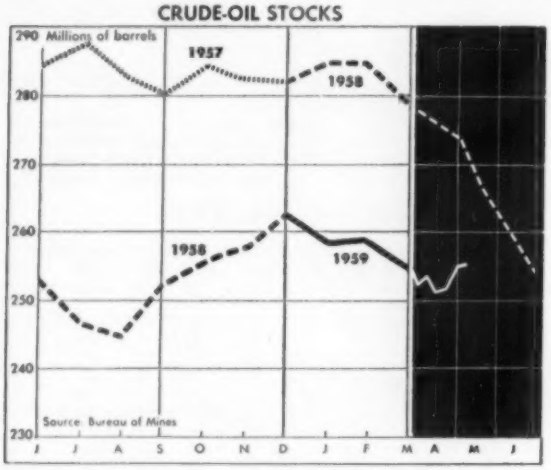
	Total wells							Cum.		Total wildcats					Cum.	
	Total	Crude	Cond.	Gas	Dry	Service	Footage	1959	1958	Total	Crude	Cond.	Gas	Dry	1959	1958
Alabama	0	0	0	0	0	0	0	38	29	0	0	0	0	0	5	10
Arkansas	13	5	0	1	7	0	37,265	317	243	2	0	0	0	2	54	58
California	25	16	0	1	8	0	116,305	563	697	7	0	0	0	7	131	135
Colorado	10	3	0	0	7	0	53,903	260	278	7	0	0	0	7	155	147
Illinois	35	22	0	0	13	0	78,548	765	693	6	2	0	0	4	131	146
Indiana	19	7	0	0	12	0	33,996	251	238	7	0	0	0	7	8	90
Kansas	95	52	0	2	36	5	336,828	1,504	1,320	13	3	0	0	10	328	258
Kentucky	25	5	0	7	13	0	51,763	601	336	6	2	0	0	4	64	42
Louisiana	63	23	5	3	32	0	535,723	1,288	1,237	10	0	0	0	10	163	178
North	20	7	0	3	10	0	85,433	454	425	2	0	0	0	2	70	67
South	31	10	5	0	16	0	319,385	692	641	6	0	0	0	6	87	97
Offshore	12	6	0	0	6	0	130,905	142	171	2	0	0	0	2	6	14
Michigan	6	5	0	0	1	0	16,038	201	141	0	0	0	0	0	50	46
Mississippi	5	1	0	0	4	0	49,128	240	144	3	0	0	0	3	110	73
Montana	1	1	0	0	0	0	5,509	103	135	0	0	0	0	0	39	57
Nebraska	20	4	0	0	16	0	123,619	289	237	10	0	0	0	10	132	112
New Mexico	41	28	0	5	8	0	166,038	660	712	8	4	0	0	4	75	97
West	21	14	0	5	2	0	49,230	290	339	5	3	0	0	2	24	44
East	20	14	0	0	6	0	116,808	370	373	3	1	0	0	2	51	53
New York	0	0	0	0	0	0	0	122	207	0	0	0	0	0	12	14
North Dakota	8	7	0	0	1	0	49,181	171	167	0	0	0	0	0	36	55
Ohio	22	8	0	5	8	1	60,115	353	377	0	0	0	0	0	9	3
Oklahoma	96	46	1	8	40	1	389,284	2,196	2,449	11	0	0	1	10	334	327
Pennsylvania	0	0	0	0	0	0	0	163	39	0	0	0	0	0	3	6
Texas	368	207	6	14	125	16	1,492,555	7,105	6,809	64	4	0	1	59	1,331	1,407
Dist. 1	15	10	0	1	4	0	32,045	432	375	4	0	0	0	4	111	143
Dist. 2	15	2	3	2	8	0	91,016	309	273	5	0	0	1	4	87	71
Dist. 3	24	7	0	0	17	0	150,949	417	470	7	0	0	0	7	99	97
Dist. 4	26	5	0	5	16	0	136,834	452	454	9	0	0	0	9	126	140
East	11	5	1	0	5	0	74,208	408	472	4	1	0	0	3	86	132
Dist. 7-B	71	45	0	0	25	1	173,772	1,003	881	14	1	0	0	13	262	249
West	127	94	1	1	28	3	569,941	2,220	2,033	11	0	0	0	11	269	281
Dist. 9	59	25	0	1	21	12	177,060	1,339	1,375	9	2	0	0	7	247	254
Dist. 10	20	14	1	4	1	0	86,730	525	476	1	0	0	0	1	44	40
Utah	4	3	0	0	1	0	23,824	134	179	1	0	0	0	1	37	32
West Virginia	9	0	0	9	0	0	26,124	255	252	0	0	0	0	0	6	9
Wyoming	10	7	0	0	3	0	40,482	295	276	2	0	0	0	2	94	81
Miscellaneous	0	0	0	0	0	0	0	23	40	0	0	0	0	0	18	34
Total U. S.	**875**	450	12	55	335	23	3,686,228	17,897	17,235	**157**	15	0	2	140	3,402	3,417
Prev. week	1,028	549	17	70	368	24	4,164,494	.....	.....	175	15	2	2	**156**	.....	.....
Cum. 1959	17,897	9,063	455	1,259	6,647	473	75,220,833	.....	.....	3,402	342	46	107	2,907	.....	.....
Cum. 1958	17,235	8,593	425	1,264	6,575	378	73,574,563	.....	.....	3,417	324	57	113	2,923	.....	.....
Western Canada	41	21	0	9	11	0	194,764	863	868	13	0	0	4	9	321	319
Ontario	13	2	0	5	3	3	15,190	86	0	0	0	0	0	0	0	0

PRODUCTION

ROTARY RIGS OPERATING IN UNITED STATES



CRUDE-OIL STOCKS



CRUDE-OIL STOCKS BY STATES OF ORIGIN*

(Thousands of barrels)

	5-9-59	5-2-59	5-10-58
Pennsylvania	2,481	2,457	2,868
Other Appalachian	1,529	1,585	1,499
Illinois, Indiana, Michigan	8,871	9,119	10,907
Nebraska and North Dakota	2,403	2,172	2,232
Kansas	9,839	9,450	10,430
Oklahoma	15,947	16,414	17,286
Arkansas	1,907	1,854	2,423
Louisiana	18,953	18,583	17,610
North	3,358	3,293	2,772
South	15,595	15,290	14,838
Mississippi, Alabama, Florida	2,365	2,353	2,231
New Mexico	7,844	7,609	7,684
Texas	111,680	111,653	116,844
East Texas	9,099	8,811	7,407
West Texas	53,843	53,593	54,894
Texas Gulf	17,819	17,732	23,951
Other Texas	30,919	31,517	30,592
Wyoming	14,911	14,372	16,143
Other Rocky Mountain	9,040	9,222	7,727
California	33,284	33,681	38,904
Foreign	†14,791	14,503	19,244
Total	**255,845**	255,027	274,032

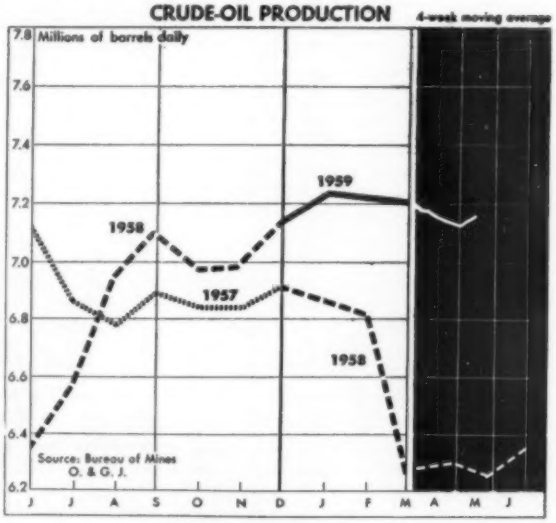
*Bureau of Mines. †Includes 4,497,000 bbl. in California.

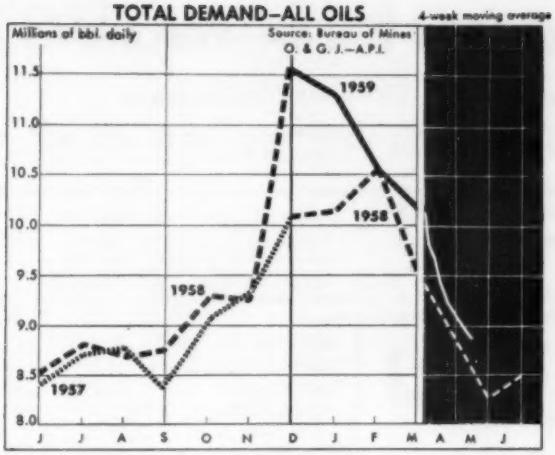
DAILY AVERAGE PRODUCTION FOR WEEK

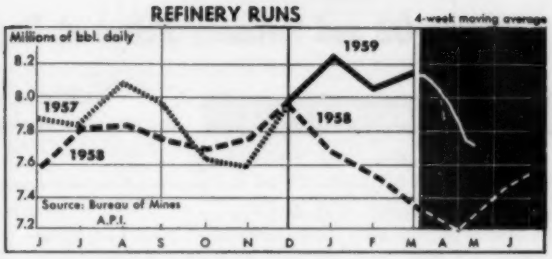
	May 16, 1959			
	Crude oil	Lease condensate	Total	May 9 total
Alabama	16,575	.....	16,575	16,500
Arkansas	81,275	175	81,450	81,650
California	839,100	.....	839,100	838,200
Colorado	127,800	.....	127,800	128,000
Eastern	44,500	.....	44,500	42,300
Florida	1,150	.....	1,150	1,150
Illinois	216,800	.....	216,800	210,600
Indiana	31,200	.....	31,200	31,700
Kansas	†317,080	.....	†317,080	†336,570
Kentucky	66,200	.....	66,200	66,400
Louisiana	867,625	105,600	973,225	973,250
North	112,625	4,600	117,225	117,250
South	755,000	101,000	856,000	856,000
Michigan	25,700	.....	25,700	25,700
Mississippi	121,600	4,825	126,425	126,425
Montana	78,900	.....	78,900	80,300
Nebraska	61,400	.....	61,400	59,800
Nevada	100	.....	100	100
New Mexico	292,500	5,200	297,700	297,700
North Dakota	38,000	.....	38,000	38,100
Oklahoma	†548,100	.....	†548,100	†563,300
Texas	2,791,000	70,275	2,861,275	2,861,275
Dist. 1	44,000	3,000	47,000	47,000
Dist. 2	122,000	7,500	129,500	129,500
Dist. 3	370,000	34,000	394,000	394,000
Dist. 4	194,000	8,600	202,600	202,600
Dist. 5	32,000	300	32,300	32,300
Dist. 6	119,000	6,500	125,500	125,500
East Texas Field	160,000	.....	160,000	160,000
Dist. 7-B	140,000	100	140,100	140,100
Dist. 7-C	136,000	3,625	139,625	139,625
Dist. 8	1,160,000	4,000	1,164,000	1,164,000
Dist. 9	207,000	1,800	208,800	208,800
Dist. 10	107,000	850	107,850	107,850
Utah	106,000	.....	106,000	85,200
Wyoming	341,900	.....	341,900	339,500
Others	‡185	.....	‡185	‡185
Total U. S.	7,014,690	186,075	**7,200,765**	7,203,905
Change from previous week, down			**3,140**	
Canada	†444,900	.....	†444,900	†364,400
Total U. S. prod.—Jan. 1-May 16				977,781,835 bbl.
Same period last year (crude plus cond.)				*886,280,393 bbl.

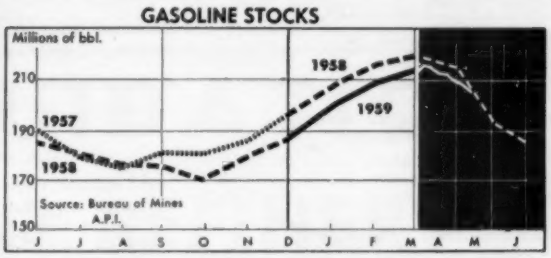
*Includes 22,312,225 bbl. condensate. †Week ended previous Monday. ‡Arizona, South Dakota and Washington.

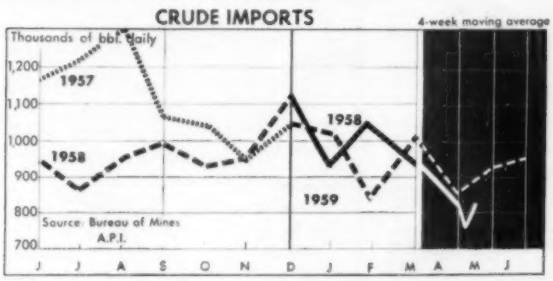
CRUDE-OIL PRODUCTION

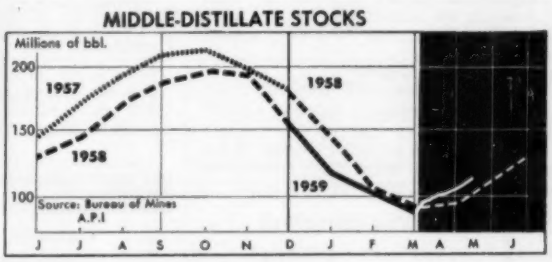


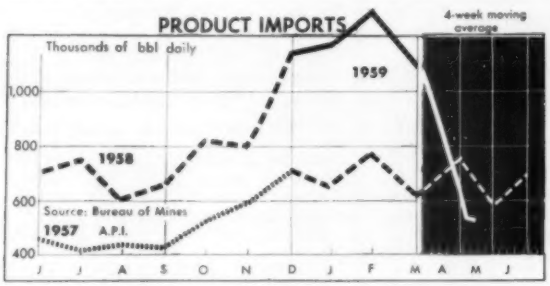


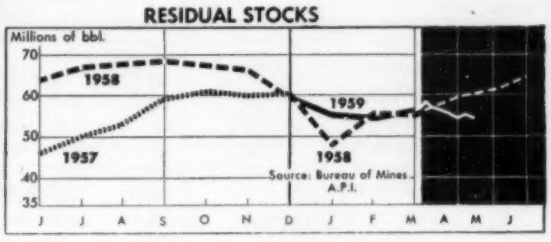












API REFINERY REPORT—MAY 15, 1959

(Thousands of barrels)

District—	Daily avg. runs	Daily average production Gaso.*	Kero.	Dist.	Resid.	Stocks‡ Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, May 1958 Daily avg. runs	Daily average production Gaso.*	Kero.	Dist.	Resid.
East Coast	936	418.7	20.4	268.6	140.2	48,915	8,764	31,381	12,159	1,112	495.8	21.6	305.5	184.3
Appalachian:														
Dist. 1	99	45.4	4.4	19.0	8.1	5,349	503	1,811	250	82	31.7	2.1	16.5	6.6
Dist. 2	84	43.9	7.4	11.6	9.3	2,605	446	875	789	85	52.3	3.2	15.3	7.4
Ind., Ill., Ky.	1,398	704.2	54.3	261.3	172.6	37,102	4,099	13,022	3,711	1,371	698.9	60.4	277.5	140.4
Minn., Wis., Dak.	114	58.3	6.7	26.7	12.9	6,683	632	3,341	391	102	47.8	7.0	25.5	10.9
Okla., Kans., Mo.	690	377.9	13.9	173.2	16.0	19,587	1,117	6,521	909	726	396.4	12.4	167.8	20.0
Inland Texas	286	182.3	5.1	50.6	16.4	7,288	299	1,354	2,095	245	168.7	6.8	34.1	19.8
Texas Gulf Coast	1,956	991.2	76.9	515.3	199.4	26,629	3,025	10,503	5,022	1,642	839.3	72.1	414.1	174.5
La. Gulf Coast	697	376.0	54.7	156.7	42.9	11,973	2,155	5,300	1,410	599	323.7	29.9	142.5	37.4
N. La. and Ark.	96	48.9	5.6	18.9	4.1	4,449	677	1,915	118	101	42.2	5.5	23.7	5.9
Rocky Mountain:														
New Mexico	14	7.9	0.3	3.0	1.4	734	43	137	124	29	15.0	0.3	5.7	2.6
Other Rocky Mt.	209	95.0	0.9	48.6	36.7	6,314	207	2,150	1,025	239	110.1	1.8	51.2	27.3
West Coast	1,105	481.9	10.0	208.6	231.4	28,988	546	11,329	27,226	1,078	446.7	3.9	156.8	283.4
May 15, 1959	7,684	3,831.6	260.6	1,762.1	891.4	206,616	22,513	89,639	54,629	7,411	3,668.6	227.0	1,636.2	920.5
May 8, 1959	7,722	3,857.6	251.3	1,713.6	931.0	208,419	21,616	87,655	55,553	.....	.....	.....	.....	.....
May 16, 1958	7,479	3,600.0	268.7	1,664.3	938.3	198,307	20,306	80,771	59,503	.....	.....	.....	.....	.....

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipelines.

Crude-Oil and Refinery Prices at Representative U. S. and Foreign Points

REFINED-PRODUCT PRICES

Following quotations are for refinery products in cents per gallon moving in interstate shipments on Wednesday each week unless otherwise noted. Crude-oil prices are per barrel at the wells unless otherwise listed.

GASOLINE*

Mid-Continent (Group 3):	
★ Regular (89 octane)	11.375-11.75
★ Premium (99 octane)	14.375-14.75
Gulf Coast (cargoes for coastwise or export movements):	
★ Regular (90 octane)	10.125-10.50
★ Regular (92 octane)	10.375-10.75
★ Premium (98 octane)	11.625-12.00
California (rack) (Los Angeles):	
Regular (88 octane)	12.65
Premium (94 octane)	13.65
Premium (98 octane)	14.65
Caribbean area (cargoes):	
Regular (87 octane)	10.125
Premium (97 octane)	11.875

*Quotations are for octanes shown. Prices usually vary with octane ratings within the regular, premium, and aviation grades.

NATURAL GASOLINE*

Group 3:	
Grade 26-70	4.5
Breckenridge:	
Grade 26-70	4.0

*If 26-70 natural is considered as 100%, prices for lower-vapor-pressure grades increase 2.5% for each unit drop in Reid vapor pressure down to and including 16 lb. Prices for grades below 16 lb. may vary slightly by areas or plants.

KEROSINE AND DISTILLATE

Mid-Continent (Group 3):	
★ Kerosine 42-44	10.00
★ Diesel oil (58 d.i. and above)	9.75
★ Distillate No. 1	9.75
★ Distillate No. 2	9.00
Gulf Coast (cargoes):	
★ Kerosine 41-43	9.00-9.125
★ Distillate No. 2	8.50-8.625
New York Harbor (barges):	
Kerosine 41-43	10.50
Distillate No. 2	10.00
Diesel fuel, 48-52 d.i.	10.25
Caribbean area (cargoes):	
★ Distillate No. 2	8.625

WAX (LB.)

Oklahoma (Group 3):	
132-135 A.m.p. (semi-refined) in tank car	6.50
New York (export):	
126-130 A.m.p. crude-scale (solid in bags or barrels)	7.35

★Denotes change from previous week.

RESIDUAL FUEL (BBL.)

Mid-Continent (Group 3):	
Residual fuel (max. 1% S)	$1.85-2.00
Gulf Coast (cargoes):	
Bunker C fuel	$2.00
New York Harbor (barges):	
Bunker C fuel	$2.37
Caribbean (cargoes):	
Bunker C	$2.00
California (rack):	
Bunker C fuel, Los Angeles	$2.15

LUBRICATING OILS

Mid-Continent (Group 3):	
150-160 bright stock, solvent refined, 0-10 pp., 95 v.i.	23.0
200 vis. neutral oil, solvent refined, 0-10 pp., 95 v.i.	20.5
Pennsylvania Grade:	
145-155 vis. at 210, bright stock, 8 color, 25 p.t.	22
200 vis. neutral (180° at 100°), 25 p.t.	21

CRUDE-OIL PRICES

GRAVITY SCHEDULE

	Signal Hill, Calif.	Okla-homa	Gulf Coast Tex.*	West Tex.† N.M.	Wyo. (sour)
14-14.9	$1.86	....	....	....	....
15-15.9	1.95	....	....	....	$1.81
16-16.9	2.04	....	....	....	1.86
17-17.9	2.13	....	....	....	1.91
18-18.9	2.23	....	....	....	1.96
19-19.9	2.32	....	....	....	2.01
20-20.9	2.41	$2.49	....	$2.35	2.06
21-21.9	2.50	2.52	....	2.38	2.11
22-22.9	2.60	2.55	....	2.41	2.16
23-23.9	2.69	2.58	$3.44	2.44	2.21
24-24.9	2.78	2.61	3.46	2.47	2.26
25-25.9	2.84	2.64	3.48	2.50	2.31
26-26.9	2.90	2.67	3.50	2.53	2.36
27-27.9	2.95	2.70	3.52	2.56	2.49
28-28.9	3.01	2.73	3.54	2.59	2.54
29-29.9	3.07	2.76	3.56	2.62	2.59
30-30.9	3.12	2.79	....	2.65	2.63
31-31.9	3.20	2.82	....	2.68	2.67
32-32.9	3.27	2.85	....	2.71	2.71
33-33.9	3.34	2.88	....	2.74	2.75
34-34.9	3.41	2.91	....	2.77	2.79
35-35.9	3.47	2.94	....	2.80	2.83
36-36.9	3.52	2.97	....	2.83	2.87
37-37.9	3.56	2.99	....	2.86	2.89
38-38.9	....	3.01	....	2.89	2.91
39-39.9	....	3.03	....	2.92	2.93
40-40.9	....	3.05	....	2.95	2.95

*Low cold test crude. †Sour.

Effective dates of broad changes: California, 1-26-59; East of California, January 3-10, 1957; Pennsylvania Grade 4-1-59.

FLAT PRICES

Louisiana:	
Sweet Lake	$3.00
Texas:	
East Texas	3.25
Conroe	3.53
Van	3.08
Pennsylvania Grade:	
Bradford	4.25
Middle District	4.07
Southwest Pennsylvania	3.80
West Virginia	3.67
Buckeye Grade	3.25
Illinois Basin	**3.00**

FOREIGN

Canada:	
Leduc-Woodbend	2.53
Redwater (Alta.)	2.42
Smiley (Sask.)	2.18
Pembina	2.38
Venezuela:	
Cumarebo, 48°-49.9°, Tucupido	3.34
San Joaquin, 41°-41-9°, Puerto La Cruz	3.08-3-10
Oficina, 35°-35.9°, Puerto La Cruz	2.80
Tia Juana medium, 26°-26.9°, Amuay*	2.30
Quiriquire, 16.0°-16.4°, Caripito	2.10
Lagunillas heavy, flat, Las Piedras*	2.10
Bachaquero, flat, 15°-16°, Las Piedras*	1.88

Prices for all crudes of 24° or lighter vary 2 cents per degree change, up or down. All crudes heavier than 24° very 2.5 cents per half-degree gravity change.

*Also available at La Salina at 3 cents per barrel less.

Middle East, Persian Gulf (cargoes f.o.b. lifting port):	
Arabian, about 34°, Ras Tanura	$1.89
Iranian, 34.0°-34.9°, Bandar Masur	1.86
Iranian, 34.0°-34.9°, Abadan	1.81
Iraq, 36.0°-36.9°, Fao	1.82
Kuwait, 31.0°-31.9°, Mina-al-Ahmadi	1.67
Qatar, about 41°, Um Said	2.05
Middle East, E. Mediterranean:	
Arabian, about 35°, Sidon	2.29
Iraq, about 35°, Tripoli, Banias	2.29
Far East (cargoes, f.o.b. Lutong, Sarawak):	
Seria Light, 37°	2.57

TANKER RATES PER LONG TON

(Latest reported spot fixtures)

Gulf-U.S.N.H., clean (ATRS —37.5%)	$1.78
Carib.-U.S.N.H., dirty (ATRS —65.0%)	0.95
Gulf-San Francisco, clean (ATRS —68.0%)	2.08
P.G.-U.S.N.H., dirty (USMC—70%)	3.81

CLASSIFIED ADVERTISING

. . . your market place for the oil and gas industry

RATES:

UNDISPLAYED CLASSIFIED 25c a word one issue. 10% discount three or more consecutive issues. $5.00 minimum charge. Blind Box in our care nine words. Payable in advance.

DISPLAY CLASSIFIED
$15.00 a column inch one issue . . .
10% Discount three or more consecutive issues.

Address Classified Advertising Material: The Oil and Gas Journal, P. O. Box 1260, Tulsa 1, Okla.

EXCEPT . . .

WESTERN STATES: (California, Washington, Oregon, Idaho, Nevada, Utah, and Arizona) Write: Classified Departments, Inc., The Oil and Gas Journal, 4041 Marlton Ave., Los Angeles 8, Calif. Phone: AXminister 2-0287.

FOR SALE EQUIPMENT

1—60 HP MODEL #540 Reda Pump complete. 2—75 H.P. G.E. Tri Clad motors, 1150 RPM, rebuilt, guaranteed new. Buy or trade for: Pumping unit, late model—80,000 lb. gear box 42-48" stroke. Marvin E. Boyer Oil Company, Inc., Iola, Kansas.

FIVE NEW Byron-Jackson & Bingham multi-stage Pipe Line Pumps 350-400 GPM @ 1130'-1450' head; Nine used Clark Bros. Gas Compressor cylinders 4½"x14" Type VSF, 3,000 psi. WP; 37 Shell & Tube Heat Exchangers, all floating head, 200 to 2,000 sq. ft. area. Send for list. KINSLOW EQUIPMENT COMPANY, P. O. Box 5285, Tulsa 12, Oklahoma.

For Sale—Test Car

On 1958 Buick Century 4-Dr., Air Conditioning and Heater, 17,000 Miles, Equipped with Apparatus for Complete Road Octane Testing, Good Condition, $3,625 as is, where is, Mt. Pleasant, Texas.

American Petrofina,
Att.: A. C. Johnson,
Mt. Pleasant, Texas,
Telephone: PA 4-3611.

SAVE 23%

Brand New 5½" OD Drill Pipe
Spang 24.70#, Grade D, Range 2 w/5½" x 7¼" OD Spangweld Full Hole Tool Joints. Plastic Coated. Will Sell All or Part. $8.50/ft.

Harries Sales & Rentals, Inc.
ODESSA, TEXAS
P. O. Box 1568
EMerson 6-3674

GOOD USED DRILLING, WELL-SERVICING, AND CABLE-TOOL RIGS AND EQUIPMENT

Financing or lease purchase plans available on the following:

ROTARY DRAW WORKS: Cardwell RL, KL, S, HL and L; also Wilson Atlas, Super and Mogul.
CABLE TOOL HOISTS: Cardwell RL, KL and 3-Drum RL.
SERVICING HOISTS: Cardwell K200, HS & L; also two Wilsons.
CABLE TOOL RIGS: variety available, including Bucyrus-Erie and Cardwell KL.
ROTARY RIGS: variety available, including Cardwell, Oilwell and Wilson.
COMPLETE SERVICING RIGS.
Cardwell AL w/Model 75 Mast
Cardwell AL w/Model 75 Mast
Franks 658 DTM, Truck Powered
(This unit leased)

PHONE WICHITA—AMherst 7-3311
or contact the local representative for

CARDWELL MANUFACTURING COMPANY
Box 2001, Wichita, Kansas

FOR SALE EQUIPMENT

CLIMAX BLUESTREAK ENGINE — 225 H.P., Butane, 8 cylinder, clutch, canopy, skid-mounted, good condition. Sacrifice $2,250. General Holding Corp., 163 S. Fairfax, suite 7, Los Angeles 36, Calif.

FOR SALE EQUIPMENT

WELL DRILLS - CORE DRILLS. Everything for well and core drilling in both new and used equipment at money saving prices. Fishing tools rented. Send for bulletins. Pressey & Son, Pueblo, Colo.

LIQUIDATION

AT THE

ESSO REFINERY

BALTIMORE, MD.

10,000 BBL./Day FLUID COKING UNIT	**38,500 BBL./Day CATALYTIC CRACKING UNIT**
GIRBOTOL UNIT DEMETHANIZER ABSORBER	**4,400 BBL./Day ALKYLATION UNIT**
20 TOWERS from 2'6" to 16' Dia., 20' to 145' high up to 300 psi	**HEAT EXCHANGERS and CONDENSERS 100 to 4,600 sq. ft.**
50 PRESSURE DRUMS Sizes up to 12'x50', Pressures to 350 psi.	**125 HOT OIL, CENTRIFUGAL and STEAM PUMPS**

- 5—500 HP RA5 Clark Gas Engine Compressors 17"x14"
- Petro-Chem RADIANT HEATER 43 Million BTU/HR.
- 41,400 CFM I.R. Turbo Blower 28.2 psi. 3,000 HP. Motor
- 22,500 CFM I.R. Turbo Blower 15 psi. 2,000 HP. Motor
- 6460 CFM CLARK Compressor 148 psi. 2,000 HP. Motor
- 1,500 INSTRUMENTS—VARIOUS SIZES & TYPES

Most Equipment New Since 1954

Your inspection invited—representatives on premises
Write—Wire—Phone for Complete Information

HEAT & POWER CO., Inc.

Site Office—Boston & Haven Sts., P. O. Box 5203, Baltimore 24, Md., Dickens 2-0224
New York Office—60 East 42nd Street, New York 17, N. Y., MUrray Hill 7-5280
Tulsa Office—306 Thompson Bldg., Tulsa 3, Okla. Diamond 3-4890

SALES AGENTS FOR LIPSETT, INC.

FOR SALE EQUIPMENT

FOR SALE—3 miles 2" line pipe, 127' Mast 7' Substructure, 131' Mast 11' Substructure, one 3 motor unit drawworks, one two motor unit drawworks, Waukesha engines. Call CEntral 2-6318, Oklahoma City, EM 8-6805, or RI 8-1118, Dallas.

AVAILABLE IN DALLAS. 20,000 — 1" Number 1 Used Smls. Upset Tubing, 25' Lengths, Tested 3,000# psi. @ $39.00 CFT. 24,000'—1¼" Number 1 Used Smls. Regular Tubing, 25' Lengths, Tested 3,000# psi. @ $36.00 CFT. Contact George Barber at HAmilton 8-1301 in Dallas, Texas, Box 9247.

FOR SALE—6,500' Grade E 4½ Flash-Weld Drill Pipe 6¼ Hughes Joints, Tubscope #1. 8,500' extra hole Grade E 4½" Flash-Weld, Hughes Joints, Tubscope #1, located Liberal, Kansas. Call CEntral 2-6318, Oklahoma City, EMerson 8-6805 or RIverside 8-1118, Dallas, Texas.

NEED PIPE? 8" Steel, Wt. 28 lbs., beveled for welding, straight machine cleaned, coated, strictly No. 1 grade. Pittsburgh Testing Lab. report furnished. Indiana-Ohio Pipe Co., P. O. Box 323, Phone 3-4674, Decatur, Indiana.

JUST PURCHASED

MODERN 37,000 BBL. REFINERY DESTREHAN, LA

10 miles north of New Orleans

CONSISTING OF THE FOLLOWING UNITS

- 19,000 BBL. CAT CRACKER (1953)
- 6,000 BBL. HYDROFORMER (1953)
- 2,000 BBL. ALKYLATION (1953)
- 7,000 BBL. VACUUM DISTILLATION
- 6,000 BBL. ASPHALT PLANT
- 3,000,000 BBL. TANK FARM
- BOILER PLANT: 6—B&W BOILERS, 70,000#/hr. 600 psi. (1952)

FEATURE ITEMS

3—Clark HMA-8; HMA-4 330, 165 hp. right angle gas engine compressors
1—IR 2-stage compressor type HHE-2, 3170 cfm, 125 psi, 600 hp. synchronous G. E. motor.
4—Portable Furnaces 10, 15, 11.5 and 12.7 mil. BTU/hr.
1—Carrier 38,300 cfm centrifugal compressor, 32.7 psi, 3,370 hp. Turbine
1—Carrier 9,370 cfm centrifugal compressor, 124.7 psi, 2310 hp. Turbine
100—Heat Exchangers Up to 4,600 sq. ft. Steel-Brass-Chrome
100—Pressure Vessels
30—Vertical towers, up thru 10' diameter, 100 ft. height
200—Centrifugal pumps with explosion proof motors and turbine drives
10—80,000 bbl. storage tanks
30—55,000 bbl. storage tanks
4—5,000 bbl. Hortonspheres
3—10,000 bbl. Hortonspheroids
Modern Grease Plant including Canning Facilities

8,000 Tons of pipe—up to 16 in. diameter!
15,000 Tons of Cast Iron and Steel Valves!
Large quantity of Fittings.

Brochure mailed on request.
Representative on Location, phone Norco Louisiana 6571

BRILL EQUIPMENT COMPANY

4101 San Jacinto St., Houston 4, Texas, JA 6-1351
2401 Third Avenue, New York 51, N. Y., CY 2-5703

FOR SALE EQUIPMENT

500,000 FT. 10¾" O.D. 35-40# No. 1 grade, machine cleaned, plain end, random lengths, straight, coated, price $1.65 a ft. f.o.b. cars Columbus, Ohio. Central Ohio Pipe Co. Phone 3-3377, Decatur, Illinois.

FOR SALE—200,000 feet of 10¾" OD—40# —8V LW No. 1 Grade Line Pipe. T&C or PE. Lundquist Pipe & Supply Co., 325 Wright Bldg., Tulsa, Okla. Ph. LU 5-8850.

2—CATERPILLAR three phase light plants at a bargain. Only reason for selling—our electric requirements too big for these plants. H. L. Betz, Lane, Kansas.

PIPE—4,000 feet of 2⅞" Rg. 2, N80 Tubing with 3⅝" OD Reed I.F. Tool Joints. Write P. O. Box 4, or call 767-3241, Wichita Falls, Texas.

1500 FAILING, heavy duty, 42' mast, drill pipe, trailer, water truck. 71 Star complete. Fred Butler, Box 481, Pueblo, Colo.

FOR SALE—8 Clark gas engine compressors, size RA-8, RA-6, RA-4, RA-3. Box L-305, The Oil and Gas Journal, Tulsa, Oklahoma.

USED PIPE AND USED TANKS—For Sale. Rogers & Wright, Incorporated, 216 West Second Street, Tulsa, Oklahoma; 710 Peoples Building, Charleston, West Virginia.

FOR SALE—Used Ingersoll-Rand Vacuum Pump, First Class Condition—Imperial Type 10B—2 cylinder, 17 x 18. HARMON OIL COMPANY, Box 751, El Dorado, Kansas.

FOR SALE—Complete refining units, Skimmer, Thermal Cracker, Debutanizer, Depropanizer, and other good equipment. J. C. Hinds—Box 652, Palestine, Texas Day Phone LE 8-2241, Night Phone 4613.

32 FOOT AMERICAN trailer house—ideal for drilling crew—sleeps six, butane refrigeration. $2,000. C. E. Bannister, 2727 Carolina Way, MA 3-5711, Houston 5, Texas.

LOCATED AT Neodesha and Iola yards: 11,500' 3", 22,000' 4", 15,500' 5", B. T. Pipe, double randon lengths. Also, 27 miles of welded pipe and B. T. Gas Lines 4" to 6" located in Wilson and Montgomery Counties, to be taken up. L-349, The Oil and Gas Journal, Tulsa, Oklahoma.

PLANT LIQUIDATION—Gasoline Plant at Benavides, Texas, 2,000 bbl. Crude Topping unit; Depropanizer & Debutanizer complete; misc. columns; vessels; pumps; heat exchangers; gas compressors; Oil heaters; Oil & Gas Separators; atmospheric sections; Propane & Butane Storage Tanks; other tanks 250 to 3,000 bbl. capacities; steel buildings. Send for list. KINSLOW EQUIPMENT COMPANY, P. O. Box 5283, Tulsa 12, Oklahoma.

TANKS—TREATERS
METERING SEPARATORS
WELLCRACKERS—DEHYDRATORS
CHIEF EQUIPMENT CORPORATION
1715 York Street, Denver, Colorado
1474 Main, Durango, Colorado

COMPLETE LINE OF MAP RACKS
for oil companies, geologists, engineers for compact storage of maps, prints, charts and drawings. All steel welded construction, ball bearing casters, baked on black enamel. Hold from 30 to 100 map tubes. Write today for description and low prices.
Frontier Manufacturing Company
P. O. Box 13286, Dallas 20, Texas

Dismantling Refinery Units

Pumps—Over 100 pumping units—Many sizes and varieties—steam, piston, gear, centrifugal, screw, and ammonia pumps. (Gould, Worthington, Carbondale, Quimby, Cameron, and National Transits)
Filter Presses and Heat Exchangers
Steam Turbines and Regenerators
Electric motors, 3 to 175 H.P.
Valves—Large quantity 1" through 12"
Air Compressors and Refrigeration units

Write for Details & Prices
PEPPER TANK CO.
P. O. BOX 1488
PHONE 2-3533
CASPER, WYOMING

FOR SALE EQUIPMENT

NEW IDECO RIGS AND MACHINERY

RECONDITIONED AND USED MACHINERY
USED RIGS

LOCATED MEDITERRANEAN AREA. Used 8,500′ Diesel-Powered Rig Complete with Spare Parts, Bits, Mud, Trucks, Casing, Tubing. Ready for further foreign operations. Offered by Fraber International, our foreign division.

LOCATED OKLAHOMA CITY. Excellent Used Lee C. Moore 126′ Highspeed Mast with 5′-6″ high Substructure.

LOCATED ODESSA, TEXAS. Used B-14 Emsco 7¼″ x 14″ Slush Pump with BA-14 Eight Pot Fluid Cylinder. Excellent Value.

We also have available complete shallow, medium and deep hole used rigs of various makes and used and reconditioned fill-in items strategically located in Oklahoma, Kansas, West Texas, Four Corners and Rocky Mountain Areas.

LUCEY PRODUCTS CORPORATION

DALLAS - ODESSA, TEXAS • OKLAHOMA CITY - WOODWARD, OKLA.

EQUIPMENT WANTED

QUOTE DELIVERED PRICE—10 miles of 3″, 4″, or 6″ Invasion Pipe, complete with couplings. Contact, Pipe, c/o Box 52, Chanute, Kansas, or telephone 219.

PIPE MACHINE having capacity 2½″ to 6″ preferred, either Landis or Bignall & Keeler, equipped with Landis Head. Advise price, location and condition. Box L-327, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED: 1,500 ft. Failing, 1,800 ft. 2⅜″ drill pipe. Complete and ready to drill. Box L-350, The Oil and Gas Journal, Tulsa, Oklahoma.

HELP WANTED

PROGRESSIVE AND EXPANDING oil tool mfgr. (drilling and production) has opening in research and development program for mechanical engineer capable of designing new products. Very attractive arrangement to right man. Our engineering dept. knows of this ad. Write in confidence to Box L-333, The Oil and Gas Journal, Tulsa, Oklahoma.

OIL INDUSTRY EMPLOYMENT SERVICE. Tom Robinson, owner, 405 Tuloma Bldg., Tulsa, Okla. GI 7-5974. We work with graduate, experienced engineers.

WANTED: Petroleum engineers and drilling personnel for appointments overseas. If interested, contact Mr. Looper, Overseas Craftsman's Association, 426 South Spring Street, Los Angeles.

GAS ENGINEER

Engineer with B. S. Degree in Chemical or Natural Gas Engineering and 2 to 5 years experience in gasoline plant construction and operation plus experience in natural gas sales. Large independent, Gulf Coast location. Some travel. Salary negotiable. Reply giving detailed information to

Box L-288,

The Oil and Gas Journal,
Tulsa, Oklahoma.

Production Engineers

Well known expanding major oil company has openings in district offices of domestic oil and gas producing operation. Minimum of three years production experience required; water flood experience desirable. Response should include salary expected and complete resume of education and experience. Our employees have been informed of this advertisement.

Box L-309,

The Oil and Gas Journal,

Tulsa, Oklahoma.

HELP WANTED

Physical Metallurgist
OR
Metallurgical Engineer

B.S. with minimum five years manufacturing experience.

Well versed in heat treat techniques and procedures for ferrous and non-ferrous metals. Capable of specifying metals and treatment to specific use. Should be familiar with welding, machining and finishing.

Capable of handling metallurgical aspects of oil well equipment manufacturing plant. Location Southwest.

Salary open. All replies confidential. Send complete resume to:

Box L-332,

The Oil and Gas Journal,
Tulsa, Oklahoma.

PROCESS SUPERVISORS
AND
OPERATORS

To supervise operation and maintenance and train customers' employees in Urea Plant in Korea. Assignment for 18 months or more.

REQUIRE EXPERIENCE IN:

AIR SEPARATION
PARTIAL OXIDATION
SHIFT CONVERTERS
AMMONIA SYNTHESIS
or UREA SYNTHESIS

ALSO DESIRE:

Technical Personnel
AND
Laboratory Supervisors

All inquiries kept confidential. Consideration based on submission of complete chronological experience. Resumes to:

McGraw-Hydrocarbon (S&T)
161 East 42nd Street
New York, N. Y.

HELP WANTED

SALESMAN EXPERIENCED selling pressure regulating and other control valves. Newly created job. Excellent opportunity. Valve Division, Ralph N. Brodie Company, San Leandro, California.

NEW OIL EMPLOYMENT Directory, foreign and domestic, showing where to apply for jobs. 500 selected producing, refining, LPG and pipeline companies. Nationwide. $7.50 cash. OIML Co., Box 2603, Tulsa, Okla.

WANTED—Man to supervise dismantling tank farm, piping, and refinery. Gulf Coast area. Contact Brill Equipment Co. 4101 San Jacinto St., Houston, Texas. JA 6-1351.

DISTRICT MANAGER-GEOLOGIST. Denver Office covering Rocky Mountain region. Minimum of five years experience in this area. Must be aggressive with initiative and ability to perform duties of planning and supervision of exploration program at district level. Medium size, progressive oil company. Growth potential. Submit resume, including references, recent photograph, and salary required to Box L-331, The Oil and Gas Journal, Tulsa, Oklahoma. Replies are strictly confidential, and our employees know of this advertisement.

TOP LEVEL CONSULTANT ON GAS OPERATIONS

Opportunity with large engineering and management consulting organization. College graduate, with broad experience in natural gas operations including administration, engineering, operations and knowledge of economics of gas business including rates. Salary open—experience and capacity controlling. Send complete resume including education, experience, references and salary expected to: Box L-347, The Oil and Gas Journal, Tulsa, Oklahoma.

WORLD-WIDE OPPORTUNITIES
FOR
Outstanding Pipe Line ENGINEERS

As a result of continued growth on an international scale, PIPE LINE TECHNOLOGISTS, INC. and affiliated companies will continue to have job opportunities for experienced Pipe Line Engineers.

We have opening at both intermediate and advanced levels in both the United States and foreign locations. Normally, the initial assignment of new staff members is in our Houston headquarters with the possibility of recurring short or long term assignments in other parts of the United States and foreign countries.

Resumes, which will be kept strictly confidential, are invited from graduate engineers with experience in responsible capacities in hydraulic and mechanical design of pipe lines and pipe line facilities, including pump stations, compressor stations and terminals. Experience in estimating and economic studies also desirable. Openings also are expected for experienced construction engineers capable of being assigned as Project Engineers on foreign jobs.

These are unusual opportunities for well-qualified men who want to work in an atmosphere where the individual can have an important impact on the overall picture by the competent handling of challenging and out-of-the-ordinary job assignments.

Salaries commensurate with training and work experience. Liberal, well-balanced employee benefit plans.

Please include in resume full particulars regarding education, experience and salary requirements. Arrangements will be made for individual interview with interested and qualified persons.

Pipe Line Technologists, Inc.
3431 West Alabama P. O. Box 22146
Houston 27, Texas

HELP WANTED

RESERVOIR ENGINEER. Experience in reserve and evaluation of all types of properties. Minimum of five years experience required. Medium sized progressive oil company. Growth potential. Submit resume, including references, recent photograph, and salary required to Box L-321, The Oil and Gas Journal, Tulsa, Oklahoma.

PRODUCTION ENGINEER: Growing independent oil company has opening for graduate petroleum engineer to supervise drilling and production operations in Wyoming. Minimum 4 to 6 years experience in field production work. Age: 28 to 40. Salary commensurate with experience. Inquiries will be confidential. Submit resume of experience and education to: Box L-351, The Oil and Gas Journal, Tulsa, Oklahoma.

—Established—

OHIO ASPHALT REFINERY

WANTS: Superintendent. Asphalt experience desirable. Though general refinery experience suitable. Excellent opportunity for right man. Respond:

Box L-348

The Oil and Gas Journal,

Tulsa, Oklahoma.

SITUATION WANTED

ADMINISTRATIVE GEOLOGIST—Age 36. Presently employed. Diversified experience in Exploration, Exploitation, Geophysical and Land operations. Completely qualified to negotiate, initiate and supervise exploratory program in domestic or foreign area. Desire permanent responsible position requiring initiative with compensating authority and remuneration. Superior references and resume available. Box L-344, The Oil and Gas Journal, Tulsa, Oklahoma.

INDUSTRIAL RELATIONS: B. S. Industrial-Labor Relations, age 30, ten years with major oil company U. S. and South America in training, employment, labor relations, safety, testing, communications. Present position Compensation and Benefits Administrator for 5,000 employees. Knowledge Spanish. Heavy experience in reorganization problems and employee development. Excellent references. Box L-345, The Oil and Gas Journal, Tulsa, Oklahoma.

ENGINEER-MANAGER — MS degree in Petroleum Engineering. 10 years concentrated experience in drilling, production, and management with major and independents. Excellent references. SEEK CHALLENGING OPPORTUNITY WITH AGGRESSIVE INDEPENDENT. Box L-315, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOPHYSICIST, 27, B.S. Geology, 6 years experience Canada and Alaska wants position with aggressive company. Will relocate. Box L-334, The Oil and Gas Journal, Tulsa, Oklahoma.

Purchasing Agent

Eighteen years diversified experience as Purchasing Agent in the procurement of drilling, production, refining, and marketing materials, supplies, and equipment. Also possesses oil well supply company and accounting experience. Good health and habits. Brochure on request. Prefer Wichita Falls, Texas area. Consider relocating. Best references. Available now.

BOX L-320,
THE OIL AND GAS JOURNAL,
TULSA, OKLAHOMA.

MANAGEMENT

Former drilling contractor with 25 years experience in drilling, production, exploration and acquiring oil and gas production for his own account, desires connection with either individual, group, or company that needs management, supervision and future exploration direction. Last 15 years in West Texas and New Mexico. Location unimportant if justifiable.

Either domestic, foreign or both.

Would desire opportunity to participate in future exploration and development. Have qualified geological and exploration staff.

R. MAKIN

P. O. Box 1628 Hobbs, New Mexico

PRODUCTION WANTED

WANTED: Oil properties. 100 to 5,000 barrels daily in Oklahoma and Kansas. Morris Sitrin, P. O. Box 1160, Tulsa, Okla.

SCOUTING REPORTS

GEOLOGICAL RECORDS FOR SALE. Scout tickets, 1936 to date, covering Illinois, Indiana and Kentucky. Tickets compiled by Major Oil Company. Elevation Sheets, Plat Books, priced cheap to sell for cash. Contact: Doc Niemiller, 2216 Washington Avenue, Evansville, Indiana. Telephone: GR 6-7577.

SCOUTING SERVICE

APPALACHIAN BASIN—Weekly scout reports; exploration and development—New York, Pennsylvania, West Virginia and Maryland. For information write: H. & R. SCOUTING SERVICE, Box 312, Coudersport, Penna.

Wire—Airmail—Dial 4-4301 Ext. 804

The ALASKA Oil Scouts

SUITE 804 MT. McKINLEY BLDG.
ANCHORAGE, ALASKA
Your Alaska Representatives

BUSINESS OPPORTUNITIES

BIG CAPITAL AVAILABLE—Want big Texas oil deals. Give brief details. Will reply only to offers of interest. P. O. Box 4332, Austin 51, Texas.

FOR SALE: Well Service business. Steady work. Major Company. 2 or 3 rigs. 3,000' Okla. area. Box L-346, The Oil and Gas Journal, Tulsa, Okla.

ESTABLISHED WELL SERVICE company in West Texas for sale. Excellent reputation. New equipment. Experienced employees. Box 1417, Levelland, Texas.

12½% INTEREST in completed gas well, Kay County, Oklahoma, $25,000. General Holding Corp., 163 Fairfax, suite 7, Los Angeles 36, Calif.

WANTED CONTRACTOR to bid on removal of 6,000 tons pipe valves and fittings. Gulf Coast area. Contact Brill Equipment Co., 4101 San Jacinto, Houston, Texas.

FINANCIAL CONTACTS, Underwriters, Private Brokers reached. No shopping. Confidential. Send details to Consultant—817—51st Street, Brooklyn, N. Y.

NEW PRODUCTS WANTED—Well-established, responsible company with complete facilities for developing, manufacturing and marketing oil field equipment is seeking new or improved products, preferably patented or patentable, to add to its presently well-known line. Royalty basis or outright purchase. Initial submission should identify engineering and confidential detail. Submissions will be handled promptly and confidentially. Box K-994, The Oil and Gas Journal, Tulsa, Oklahoma.

BUSINESS SERVICE

HEAVY DUTY MACHINE SHOP. Have capacity to take on additional heavy duty machine work. Specializing in machine work, hydraulic press work, and fabrication. On contract, cost plus, or hourly rate. Centrally located. Box L-316, The Oil and Gas Journal, Tulsa 1, Oklahoma.

Delaware Corporations formed and serviced. American Guaranty & Trust Company, P. O. Box 487, Wilmington, Delaware.

Venezuelan Contact

Do you need Venezuelan Contacts, Representations, Surveys or "local know-how," if so write

TEN EYCK HULL

Edificio Galipan Caracas, Venezuela
Cable: CALLHULL Telephone: 33-31-93

RESIDENTIAL PROPERTY

NEW YORK 5th AVENUE APARTMENT Available: 3 room furnished apartment available June 28 to Sept. 15. Rent $250 per month. Contact: Jack Rieger, 707 South Hill, MAdison 3-2518, Los Angeles, California.

HAWAIIAN MODERN
BEL AIR—L. A.

Lovely 2 story home just completed. 4 bedrooms, 3½ baths, many fine appointments including built-ins, marble pullmans, wet bar, room for pool.
10558 Fontenelle Way, Bel-Air
Excellent financing. Price $87,500
Leonard Fidlon, Realtor OLive 3-7180
470 S. San Vicente Blvd.,
Los Angeles 48, California.

PRODUCTION FOR SALE

TO CLOSE ESTATE Working interest up to 39.258%, with operating rights in two producing wells, Custer County, South Dakota. 160 acre lease. 1,395 ft. sand. Initial production discovery well 200 bbls. Write M. H. Phifer, Dewey, So. Dakota.

ROYALTIES

OFFERING OIL AND GAS Income Royalties and those ahead of drilling. A. S. Berry, 109 Midco Bldg., Tulsa, Oklahoma.

LEASE AND DRILLING BLOCKS

LEASING 450 ACRES of oil lands in Trinidad British West Indies—For information write to Albert Edwards, 9647 Wentworth Ave., Chicago 28, Illinois.

480 ACRE oil lease; 11 producing wells; 580 to 600 ft. deep; priced to sell. G. C. Cockran 1119 Brown Ave., Osawatomie, Kansas.

COMMERCIAL GRADE expandable shale deposit, vicinity of Rawlins, Wyoming. Interested write Mrs. C. T. Chapman, Box 84, Rawlins, Wyo.

I WILL DRILL your shallow prospect or buy your producing interest. U. S. Andersen, 8350 Santa Monica Blvd., Los Angeles 46, Calif.

DRILLING SEMI-PROVEN acreage. Two pay sands, 600 and 800 ft. ¼ interest for sale. P. O. Box 2882, Wichita, Kans.

DRILLING BLOCKS; Geologist has excellent Geological prospects, average 6,000 feet depth; several wash down and deepening jobs; mostly open acreage; will take override. Box L-335, The Oil and Gas Journal, Tulsa, Oklahoma.

WATER FLOOD Franklin County, Kansas. 640 acres, good engineering and best equipment, modern in every respect. Wonderful potential, good reason for selling. No brokers. Unless you are financially responsible do not reply. Box L-326, The Oil and Gas Journal, Tulsa, Oklahoma.

WORKING INTERESTS up to ½ for sale, Chautauqua Co., Kansas. 150 acres offset to free flood and new well 1,100 ft. sand. Box L-328, The Oil and Gas Journal, Tulsa, Oklahoma.

KENTUCKY Shallow Drilling—Solid block 1,500 acres 2 miles east new well, good oil showing northwest and south, long term low rental—Leases along Russell-Casey County Border Goose Creek area. Price $3.50 per acre ⅛ over ride and buyer start Knot formation well by July 10th. Personal inspection invited. Write, phone, wire, Wilbur V. Cravens—Russell Springs, Kentucky.

7,000 ACRE Drilling Block For Sale. Southern Nevada. Near new Shell drilling operation. General Holding Corp., 163 S. Fairfax, suite 7, Los Angeles 36, Calif.

ALASKA: Lease & Drilling Blocks in Copper River and Susitna Basins. Up to 100,000 Acres. Will file for you on Federal Lands. Alaska Oil & Leasing Service, 934—6th Avenue, Anchorage, Alaska, Phone 3-2935.

WANTED: Offset shallow drilling deals in the Illinois, Indiana, and Kentucky basin. Can drill one well per month. Send all replies to Box L-311, The Oil and Gas Journal, Tulsa, Oklahoma.

OIL AND GAS LEASE

YOAKUM CO., TEXAS

160 acres, 5 year contract. Strategically situated for exploration of Permian and deep structures. Sale price of this lease is $200 per acre, with $2 delay rental. Location; S½ S½ section 586. Write:

Dr. J. A. Robinson,
233 Twenty-first Pl., Santa Monica, Calif.

WILL SELL UP TO 40% OF
640 ACRES OF OIL & GAS

Virgin oil fields. Hurricane, Utah. Lease in shallow oil producing area. $1,330 per 1% or one 10th of 1% $150. Drilling now underway.

Taylor Oil & Gas Co., Utah Utility Bldg.,
P. O. Box 366, Hurricane, Utah.
MEdford 5-4431; or in Los Angeles,
phone WE 9-5007.

Caddo-Pine Island Field

160 acre federal oil and gas lease, full five year term, in T. 21 N., R. 16 W., La. Mer. S½SE¼, Sec. 2; and E½SE¼, Sec. 11. High bidder at federal auction will assign outright or with small override.

Box 7587 Phone
Washington 4, D. C. NAtional 8-7377

ADVERTISERS

in this issue

Acme Oil Tool Company 277
Air-Maze Corporation, The 184
Aldrich Pump Company, The 63
Allied Chemicals—
Nitrogen Division 28
Plastics and Coal Chemical Division 59
Allis Co., The Louis 167
American Iron & Machine Works Co. 65
American Meter Company 247
Ampco Metal, Inc. 73
Antara Chemicals, A Sales Division of General Aniline & Film Corporation 72
Arcair Co., The 273
Armco Drainage & Metal Products, Inc. 238
Autocar Division of the White Motor Company 147
Autoclave Engineers 173
Avondale Marine Ways, Inc. 274
Baash-Ross Tool Company 179
Baker Oil Tools, Inc. 78
Barclay Hotel, The 272
Barco Manufacturing Company 66
Baroid Division, National Lead Co. 61, 62
Bell Helicopter Corporation 80
Bethlehem Steel Company 204, 205
Supply Division 29
B-I-F Industries, Inc. 237
Black, Sivalls & Bryson, Inc. 276
Bonney Forge & Tool Works 68
Borg-Warner Mechanical Seals 233
Boston Woven Hose & Rubber Co. 145
Bovaird Supply Co., The 1
Bowser, Inc. 225
Burroughs Corporation 32, 33
Byron Jackson Pumps, Inc., a Subsidiary of Borg-Warner Corporation 155, 156, 157, 158
Cabot Shops, Inc. ..... Inside Back Cover
Cameron Iron Works, Inc. 216
Canadian Bank of Commerce, The 206
Canadian Industries Limited 216
Canadian Western Pipe Mills, Ltd. 142
Chain Belt Co. 30
Chance Co., A. B. 249
Christensen Diamond Products 253
Cities Service Oil Co. 64
Classified Advertising 301, 302, 303, 304
Collins Radio Company 246
Colorado Fuel and Iron Corp. 218, 219
Comptoir Franco-Belge D'Exportation Des Tubes D'Acier 19
Continental-Emsco Company, a Division of The Youngstown Sheet and Tube Company 57
Continental Motors Corp. 23
Cooper-Bessemer Corp., The 208, 209
Cooper, Inc., Fred E. 180, 181, 269
Corrosion Services Incorporated 266
Cosasco Division Perfect Circle Corporation 60
Crane Co. 133
Crose Manufacturing Co., Inc., M. J. 76
Crutcher-Rolfs-Cummings, Inc. 217
Darling Valve and Mfg. Co. 13
Davison Chemical Company Division of W. R. Grace & Co. 8, 45
De Laval Steam Turbine Co. 175, 176
Delta Air Lines 70
Dominion Bridge Company Limited 221
Dowell 226, 227
Dresser Manufacturing Division 202
Dura metallic Corporation 239
ElectroData Division, Burroughs Corporation 32, 33
Enardo Manufacturing Company 287
Fisher Governor Company 7
Foxboro Company, The 169
Franks Division, Cabot Shops, Inc. ..... Inside Back Cover
Fyr-Fyter Company, The 42
Gardner-Denver Company 234, 235
General American Transportation Corporation 150
Genesys Corporation 75
Geophysical Service, Inc. 265
Goodrich Chemical Company, B. F. (Geon) 9
Grace & Co., W. R.— Davison Chemical Division 8, 45
Graver Tank & Mfg. Co. 207
Grip-Tite Manufacturing Co. 200
Grove Valve and Regulator Company 10
Guiberson Corporation 34
Haering & Co., Inc., D. W. 223
Halliburton Oil Well Cementing Co. ..... Inside Front Cover, 20, 21
Hammond Iron Works 53
Harnischfeger Corp. 254
Hill, Hubbell and Company Division of General Paint Corporation 211
Homco 69
Houdry Process Corporation 148, 149
Houston Contracting Company 231
Huey & Co., S. E. 216
Hughes Tool Co. ..... Back Cover
Humble Oil & Refining Co. 271
Hunt Tool Company 280
Hycalog, Inc. 248
International Harvester Co. 164, 194, 195, 288, 289
International Register Company 187
Iverson Supply Company 67
Jones & Laughlin Supply Division 266, 267
Kelley Company, Ben F. 279
Kellogg Co., The M. W. 153
Keystone Development Corporation 216
Keystone Valve Corporation 244
Koenig Iron Works, Inc. 239
Kolor-Kut Products Co. 275
Larkin Packer Company, Inc. 258
LeTourneau Inc., R. G. 286
Liberty National Bank and Trust Co., The 184
Lufkin Foundry & Machine Co. 15
Lummus Company 144
Lunkenheimer Co., The 31
M & V Tank Company 239
Mannesmann-Export 135
Manning, Maxwell & Moore, Inc. 230, 290
Mercantile National Bank 188
Mercoid Corp., The 270
Mid-Continent Supply Company 26
Midwest Piping Company, Inc. 240
Mission Mfg. Company 71
Moore Corporation, Lee C. 138
Murphy Manufacturer, Inc., Frank W. 210
Murray Iron Works Company 163
Nash Engineering Co. 55
National Airoil Burner Co., The 74
National Aluminate Corp. 14
National Bank of Tulsa 54
National Supply Co., The 37, 38, 39, 40
National Tank Company 306
Neill and Company, J. P. 188
Nordstrom Valve Division, Rockwell Manufacturing Company 183, 184, 187, 188
Odex Engineering Company 165
Oil States Rubber Company 11
Oil Well Supply Division 6
Olin Mathieson Chemical Corporation 143
Pacific Pumps, Inc., a Division of Dresser Industries, Inc. 241
Parkersburg Rig & Reel Co. 44, 232
Parsons Company, The Ralph M. 27
Penberthy Manufacturing Company, Division of Buffalo-Eclipse Corporation 171
Perforating Guns Atlas Corporation 260
Perrault Equipment Company 214
Petro-Chem Development Co., Inc. 243
Petroleum Distributing Co. 277
Petroleum Electric Power Assn. 56
Petty Geophysical Engineering Company 252
Philco Corporation 203
Pittsburgh Steel Company 212, 213
Polyken Sales Division, The Kendall Company 197, 198, 199
Porter & Company, Inc., H. K.— Forge and Fittings Division 193
Thermoid Division 220
Potter-Bowser Division, Bowser, Inc. 225
Raybestos-Manhattan, Inc. 250, 251
Reda Pump Company 183
Reed Roller Bit Company 136, 137
Refinery Engineering Company 41
Reliance Electric and Engineering Co. 25
Republic Rubber Division of Lee Rubber & Tire Corp. 282
Republic Steel Corporation 46, 47, 48
Rockwell-Standard Corporation 12, 36
Rockwood Sprinkler Company 255
Roebling's Sons Company, John A. 295
Rohm & Haas Company 166
Rolatape Inc. 259
Royal McBee Corporation 215
Sargent Engineering Corporation 141
Schlumberger Well Surveying Corp. 257
Sheffield Steel Division, Armco Steel Corporation 222
Smith Company, Tyson 256
Smith Machine Works, Ed W. *254*
Southwestern Graphite Co. 275
Southwestern Industrial Electronics Co. 192
Stewart & Stevenson Services, Inc. 278
Sunshine Iron Works 171
Technical Oil Tool Corporation 281
Texas Company, The 24
Texas Employers Insurance Association 18
Texsteam Corporation 249
Thermoid Division of H. K. Porter Company, Inc. 220
Thompson Pump Co. 272
Thornhill-Craver Co. 22
Timken Roller Bearing Company 35
Toronto-Dominion Bank, The 242
Transcontinental Gas Pipe Line Corp. 200
Tretolite Company A Division of Petrolite Corporation 285
Triangle Valve Co., Ltd. 293
Union Switch & Signal Division of Westinghouse Air Brake Company 201
United States Rubber Company 5
United States Steel Corporation— Oil Well Supply Division 6
Valley Electric Corp. 196
Walworth Co. 49, 50, 51, 52
Warner Lewis Company 191
Warren Pumps, Inc. 245
Welex, Inc. 229
Well Equipment Mfg. Corp. 58
Wheeling Machine Products Company 196
Wolverine Tube Division of Calumet & Hecla, Inc. 43
Woodfield Rochester Limited 236
Worthington Corporation 4
Youngstown Sheet and Tube Company 16, 17

LEGAL

U. S. DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Washington 25, D. C. Notice is hereby given that 80 acres of land described as the W½SW¼ Sec. 32, T. 4 N., R. 1 E., Washington Meridian, Wilkinson County, Mississippi, within the known geologic structure, undefined, of Tar Creek Field will be offered for oil and gas leasing in one parcel through competitive bidding to the qualified bidder of the highest cash amount per acre at 1 P. M., E.S.T., May 27, 1959, when bids will be opened. Bids may not be modified or withdrawn unless the modifications or withdrawals are received prior to the time fixed for opening of the bids. Details of the lease offering, how and where to submit bids, may be obtained from the Bureau's Eastern States Land Office, Washington 25, D. C. H. K. Scholl, Manager, Eastern States Land Office, Washington 25, D. C.

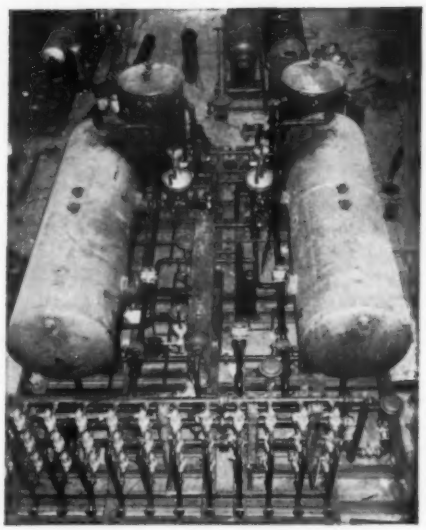
NATIONAL® automatic packaged units

WHY BUY NATIONAL PACKAGED PRODUCTION EQUIPMENT UNITS . . .

- **Made in shops having the most complete and modern facilities available**
- **Safe-tested under strictest codes**
- **Properly engineered for accessibility**
- **Lower cost due to National know-how**

National Packaged Units assure delivery at the location of COMPLETE units . . . skidding, piping, insulation, instrumentation, coatings and accessories. "Packaging" by National eliminates the purchase and assembly of hundreds of items; eliminates costly waiting time and transportation charges rounding up missing materials and fittings.

Through good engineering, design and arrangement, the connection crew in the field is concerned only with the major product lines to and from NATIONAL PACKAGED UNITS.



National can handle all your production problems "from the wellhead to the consumer."

It's a National®

Modern facilities include sand blasting and coating.

NATIONAL TANK COMPANY

TULSA, OKLAHOMA

SURROUNDED BY....

SERVICE

Main Service Headquarters

PAMPA, TEXAS

Day Phone MO 4-3277

Night Phone MO 4-3270

Field Service Directory

Oklahoma
Tulsa WE 9-6381
Seminole 2437
Lindsay PL 6-2217

Texas
Pampa MO 4-3277
Odessa EM 6-3696
Houston OL 4-8961

Kansas
Great Bend GL 3-5331

South America
Anaco, Ven. 86-239

New Mexico
Hobbs EX 7-1822
Farmington DA 5-3862

Rocky Mountains
Casper 2-5748

California
Long Beach GA 7-9594

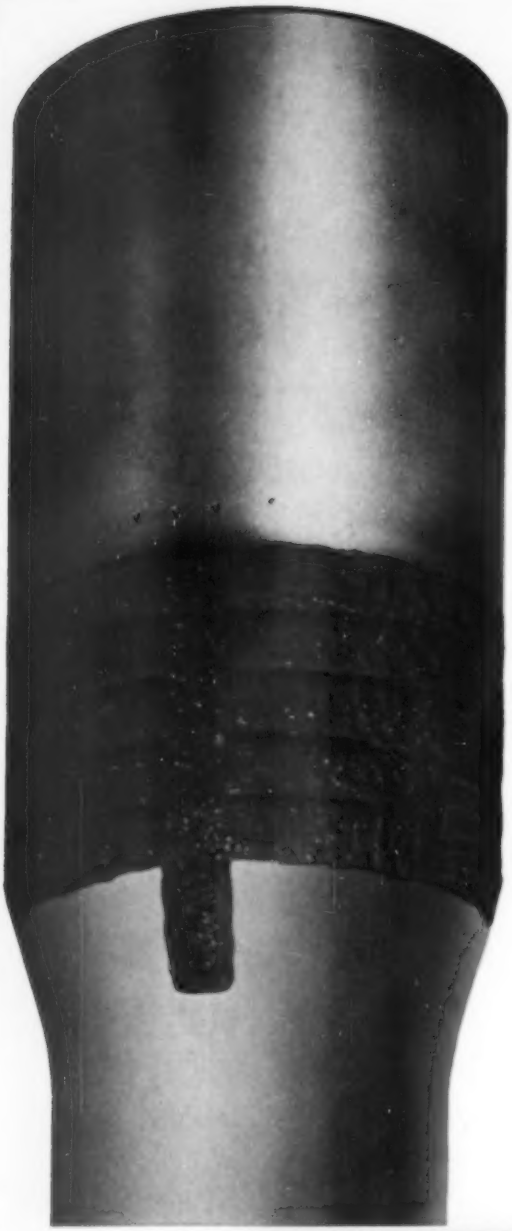
Canada
Edmonton 4-4453

CABOT, FRANKS SERVICE CENTERS ARE WHERE YOU NEED THEM . . .

Near You!

CABOT — OIL FIELD PUMPING EQUIPMENT — PAMPA, TEXAS

FRANKS — WELL SERVICING AND DRILLING UNITS — DIVISION, CABOT SHOPS, INC. — PAMPA, TEXAS



Hughes FLASH-WELD is now 21

At 21, Hughes "Flash-Weld" is the most experienced welded tool joint-to-pipe connection in the oil fields.

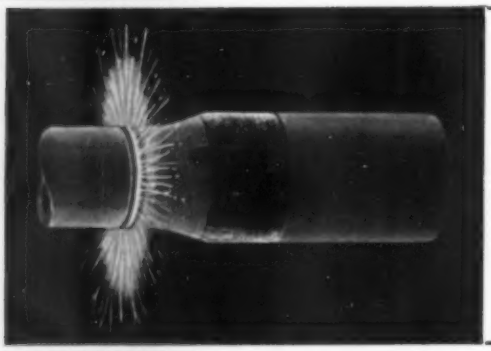
Since 1938, when Hughes introduced the first flash-welded drill string, *more than 40 million feet* of drill pipe have been unitized by the "Flash-Weld" process.

A new heat treating process has *more than doubled* the tension impact strength of "Flash-Weld" pipe connections. And new processing controls are improving the quality of the finished drill strings.

In addition to exacting physical tests, "Flash-Weld" tool joints and flash-welded connections undergo a series of critical inspections. For instance, after flash-welding, all weld areas are subjected to magnetic particle inspection. The critically-stressed areas of the tool joints themselves (this applies to all Hughes joints) are magnetically inspected. And the hardfacing on the joints is "snow" tested to check the bond of the hardfacing material to the joints.

The Hughes method of hardfacing, plus Hughes' specially developed tungsten carbide hardfacing material, assures maximum protection against wear during the life of the joints.

FLASH-WELD
A DEVELOPMENT
OF
HUGHES
TOOL COMPANY
HOUSTON TEXAS



Complete line of "Flash-Weld" joints is available for attachment to new API LIGHTWEIGHT drill pipe, as well as standard weight pipe. Ask your Hughes man.

"Flash-Weld" joints are available with tapered and square shoulders